FACTORY

MANAGEMENT AND MAINTENANCE

JULY 1943

WAR BONDS
D STAMPS
R VICTORY

The completion of this Sperry Gyroscope Company building adds another to the long list of important "war jobs" where Radiant Heating —and Byers Wrought Iron—are serving.

The system was engineered by Stone and Webster, and Alvord and Swift were the heating contractors. It was the first Radiant Heating installation for each concern. All coils were formed with a bending machine on the job, and field-welded into four unit assemblies, each individually controlled by Johnson Service Company thermostats. In situations where additional heating effect was needed in a given area, vertical panels (as shown in small illustration) were installed. The completed piping system was tested at 100-lbs. pressure for four hours, and in 19,000 feet of pipe only three minor leaks were revealed.

The coils were topped with 6-inches of concrete, poured while the coils were filled with water at 100°F. Finished floor will be bare, or linoleum covered. The heating medium is hot water at 110°F., provided by a heat exchanger and zone circulated by four Ingersoll-Rand fractional horsepower pumps.

The influence of proper heating upon production gives extra reason for checking Radiant Heating's advantages against the heating needs of any structure built today. It generally saves considerable metal, leaves all floor-space clear, and introduces no explosion hazards in dangerous operations. Byers Wrought Iron for the coils "permanizes" these advantages; its superior corrosion resistance has been demonstrated in hundreds of applications where service conditions were similar. Its thermal properties are excellent; and it can be readily formed and welded.

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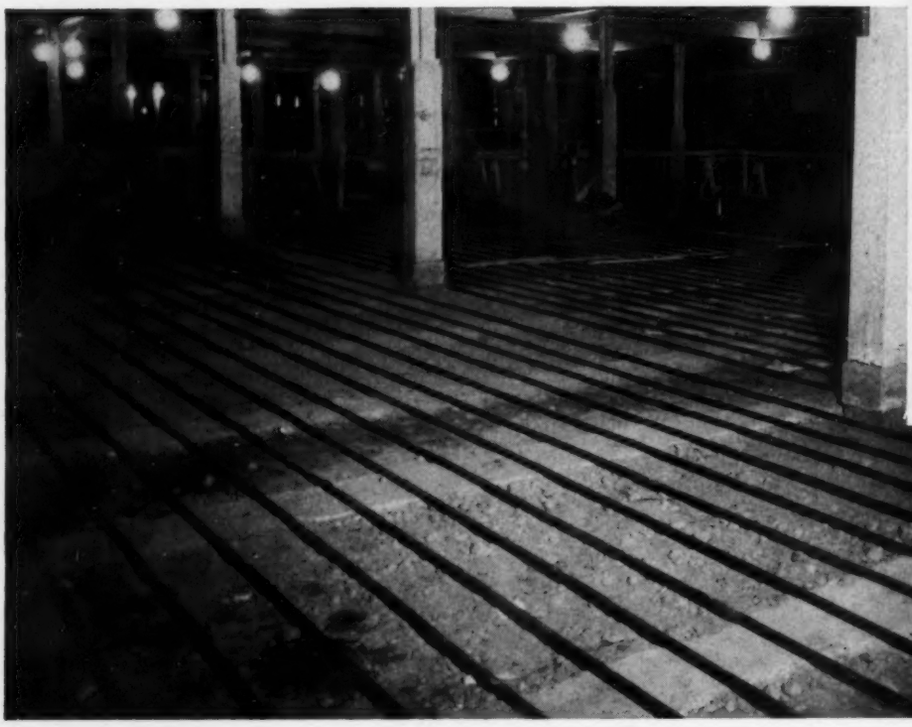

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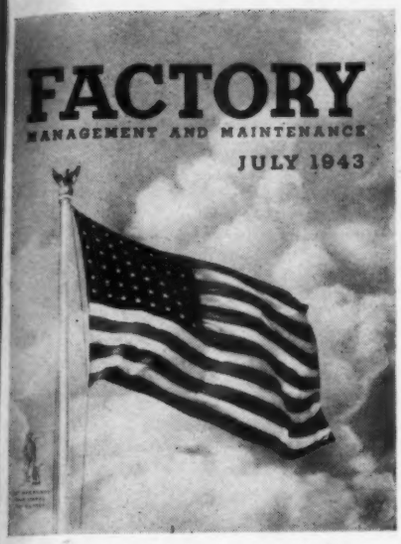

Again *Factory* joins other members of the business and industrial press in honoring the Flag. In the year that has passed since it was last displayed on *Factory's* cover, we have seen the war plants of America set new records to supply the equipment that will, in the hands of Allied fighting men, keep the Flag flying.

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FACTORY

MANAGEMENT AND MAINTENANCE

JULY · 1943

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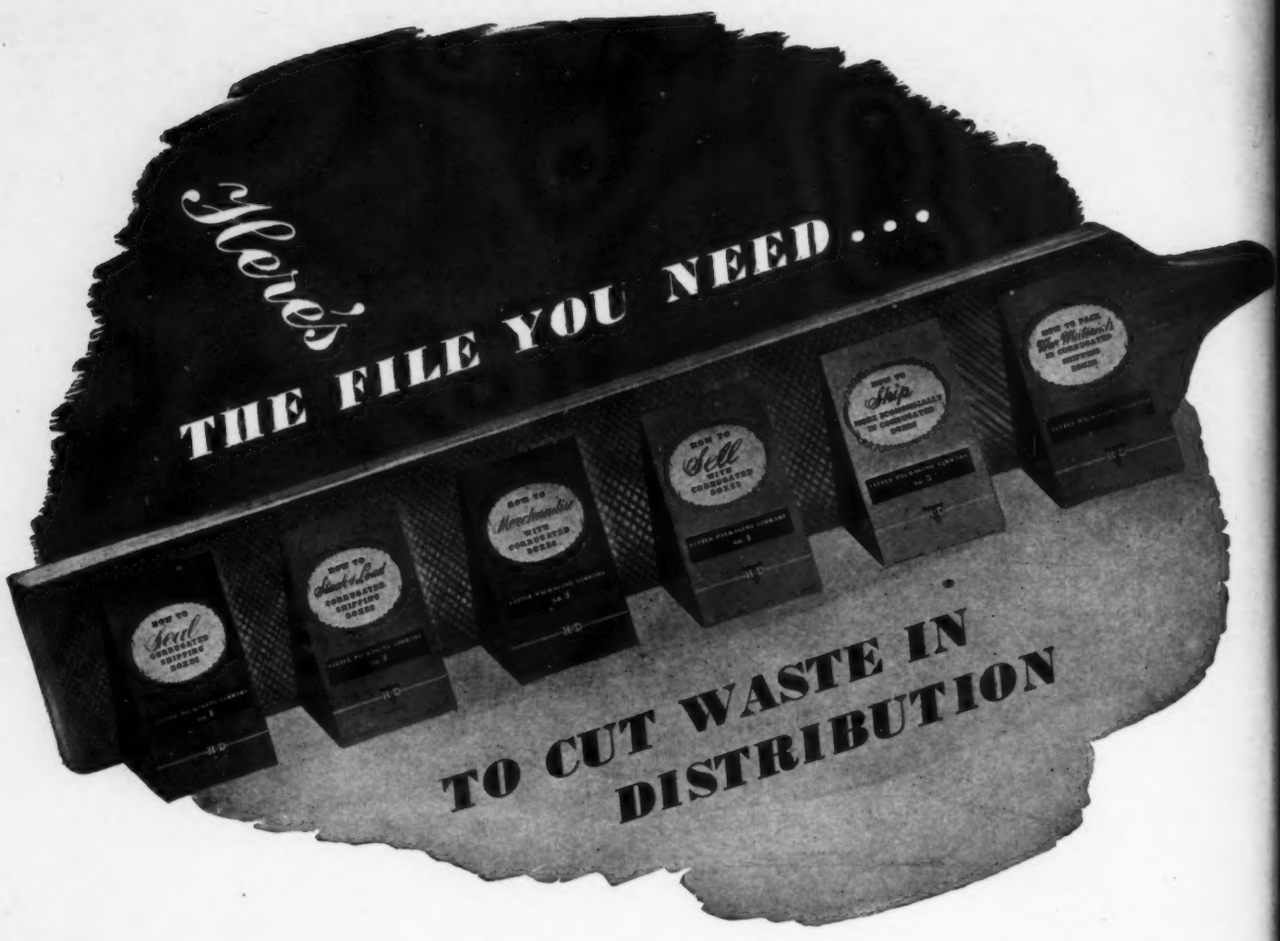

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Engin. Lit.

Engineering Design
—Creator of America's Mechanized Might

In war, as well as in peace, the design engineer is the vital link between the inventive mind and the mass-production reality

IT IS gratifying and interesting to note that reports of new "secret weapons" not only have reversed their course during the past few months . . . they also have increased in frequency. Once they filled us with dread and misgiving. Today the enemy does the worrying.

Word about the latest new Army weapon reached us as this was being written . . . a 2½ ton truck that performs on water as well as on land with equal efficiency. "The Duck", resembling an overgrown amphibious jeep, is particularly suited to landing operations where docks are lacking. Loaded with 20 fully equipped soldiers or their equivalent in supplies, its propeller runs it ashore. It climbs the beach on its six-wheel drive and continues the trip on land.

This important addition to our "second-front" fighting equipment, coming so closely on the heels of the now famous tank-killing "Bazooka", is one of many history making contributions of American design engineers — the men who transform nebulous ideas into practical realities — the men who make our war machines superior to those of our enemies.

Invasion and eventual victory became a certainty as soon as America's design engineers threw their full effort into the war against aggression. Adapting intricate ordnance designs to mass production, these men developed weapons such as the M-10 destroyer of Rommel's tanks and brought out the new fighting planes and bombers that have won the air superiority that has turned the tide against the Axis. Taking ideas and giving them form, selecting the materials of construction, deciding upon the method of fabrication, adapting the electrical and mechanical parts that power the product, specifying the finish that protects and beautifies it . . . these men are the focal point of American production. Their ingenuity has no parallel. Once they put automobiles on a mass production basis and within the reach of all. Today, after less than three years and with little previous experience in armament design, they have brought America's war weapons to the highest efficiency . . . surpassing Hitler's weapons despite all the vaunted scientific wizardry of the Germans and their ten year start.

At this point it is well to remember that while Germany's military might is traceable to its superiority in armament, many of the basic technological discoveries (including the airplane and the submarine) are the products of American genius. The Germans always have been aware of the military advantages of technological superiority and have forced its expansion with all their might. They knew that mobility and surprise play a decisive role in modern warfare and their design engineers were kept busy, with unique intensity, to achieve unprecedented results in fast-moving, hard-hitting fighting equipment. Our own military and industrial engineers did not go into action until it became certain that we would be involved in the conflict. But even before our country actually embarked on its Preparedness Program they were busily engaged in developing the designs of our war equipment. Tanks, planes, guns, ships and hundreds of other apparatus and machines of war were studied. Carefully selected committees of our national engineering societies were organized under the leadership of the Army Ordnance Department to serve as advisors and consultants in the development of advanced designs of tanks and other motorized equipment of war. The above mentioned "Duck" and the now famous Sherman tank are just two of the many results of these efforts.

After the Preparedness Program had officially been launched and Congress had made its initial appropriation, it was necessary to create the manufacturing blueprints from which the engines of war could be built. Because the designs of the machines of production, as well as the designs of the products themselves, determine the speed and economy with which anything can be manufactured,

This is the thirteenth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

the capacity of our industrial system is dependent, to a considerable extent, upon the ability and ingenuity of American design engineers. Germany's military might was successfully mechanized because Germany, for more than 10 years preceding the war, was riding the wave of a world-wide technological revolution. This revolution was as far-reaching as the advent of the electric motor and the internal combustion engine. It was born of the profusion of inventions and discoveries since the last war. German design engineers took advantage of every one of these.

If we are to defeat our enemies and if we are to continue to play the leading role in the post-war world we must make better use of the new technology than do our enemies. The job is up to American product engineers who already have made tremendous strides in designing the intricate machinery of production and of war equipment. Much remains to be done however.

It has been said that the Germans have not developed one single item that can be classified as basically original, nor are there indications that any so-called "secret weapon" will henceforth be developed by them. Today the Nazis are completely outclassed by the tremendous manpower of engineering brains that is at the disposal of American industry. Although we were faced by the same fundamental problems of shortages in materials, manpower and time, our engineers not only solved these problems quickly and effectively, but they outstripped the enemy by the preponderant weight of talent which we were able to bring to bear upon our problems. As is evidenced by studies of the designs of captured German war equipment, our airplanes are faster, carry heavier loads, have superior protective armor and heavier armament. Our tanks, especially the Shermans, stand unmatched. Our tractor-mounted artillery excels theirs in fighting power. Our automotive vehicles are the envy of the world. Our battleships are supreme. Our signal and detection devices are frustrating all of our enemies' attempts to dominate the seas.

And as we approach the end of the conflict, the pattern of which already has been set, the forces that converted American industry from peace to war-production will again be brought into play, and the product engineer will continue to be the fulcrum. Our post-war industry will grow from his blueprint. Nor will his job be any less urgent, any less responsible, any less sweeping in its effects than were his efforts during the war-preparedness program.

Since the cessation of the manufacture of peace-time goods, many new materials and production techniques have been developed. Plastics, synthetic rubber and magnesium in the field of materials were relatively new and restricted in their uses when war came. So were powder metallurgy, induction heating, electrostatic heating, adhesives for joining metals and compressed resin-impregnated wood. The new possibilities in product design created by the electronic devices and applications developed during the war period virtually stun the imagination and the "atomic revolution" promises to change the entire pattern of manufacturing operations.

Never before has there been so much speculation about the future as there is today. Looking forward, who can doubt our limitless capacity to continue our industrial world leadership?

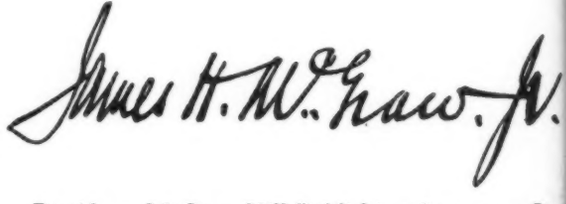
While no one can predict developments in product design in the post-war period, certain it is that they will be so vastly different and so far superior to existing designs that they will obsolete most products as we know them today. With engines of vastly superior metals, designed to burn 100 octane gasoline and built to a precision ten times greater than that of pre-war engines, our post-war automobiles will give from 40 to 60 miles to the gallon. Tires will last from forty to fifty thousand miles. The comfort and smoothness with which these cars of tomorrow will glide along are undreamed of today. Polaroid windshields will eliminate the glare of oncoming headlights and the driver will need to give but scant attention to the manipulation of his simplified gear shifts.

According to no less an authority than Igor Sikorsky, we stand on the threshold of a new air age in which the helicopter will contribute to the greatest prosperity we have ever known.

Prophecies are hard to make at a time like this but speedy house building seems to be a certainty in the world of tomorrow. Air conditioning, new methods of heating, humidifying and drying, promise to be necessities in the post-war home. Vacuum sweepers will be much lighter, less noisy and easier to manipulate. Washing-machines will be fully automatic and practically free of noise and vibration. Not only will our homes and most of the furnishings be of radically new design, but so will the factories and machines that produce them.

Only one factor can prevent the fulfillment of the dream of the product designer. His job is not accomplished over night. To convert sound ideas into production blueprints involves a great deal of time and money. The building of test models is an expensive and tedious procedure. An abundance of seed money is required to perfect the product, to develop mass-production methods and to bring it to fruition as a finished saleable product.

It is the patriotic duty of every industrial leader to hasten these developments so that the material benefits created by them may speed our progress along the road of abundance.



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FACTORY
MANAGEMENT AND MAINTENANCE
L · C · MORROW · EDITOR

A Labor-Control Law Had to Come

Principal importance of the War Labor Disputes Act (Connally-Smith anti-strike bill become law), passed late last month over the President's veto, lies in the fact that it is a signpost on the road of Administration policies in labor matters. Sooner or later, because of the way things were going, Congress had to pass a labor-control law. Here is why:

The National Labor Relations Act tells labor plainly that it can do no wrong. The anti-trust, anti-collusion, anti-conspiracy, and anti-racketeering acts exempt labor. In all its major showdowns with the government, labor has won. (Petrillo and music, Lewis and the closed shop are examples.) With such privileges, and such successes—and without responsibilities—it was inevitable that enough labor leaders would abuse their power to bring about a reaction that would result in a labor-control law.

The final straw is found in the strikes of the coal miners, which have taken place under John Lewis. They brought on the Connally-Smith bill, described by another nationally known leader as the "Lewis" bill, and termed by him the "harvest being reaped by the President," who has had "too much intellectual sympathy with the mass of the workers," and by an Administration which has treated labor to a "benevolent paternalism at the hands of nutty social workers."

Congress was in no mood to rest the nation's case against the Lewis minority on the promise that the President, with his ten-year background of giving in to labor, would use his power to prevent strikes. Lewis had always won out before, could again. Nor did the President help his case any in proposing membership in the armed services as a punishment for striking.

The anti-strike law is not good, though its objectives are. There is much likelihood that it contains ambiguities which will be used to prevent the accomplishment of its principal purpose of stopping strikes in war plants. But for employers it is a step ahead, because with it they will have more chance of keeping their plants out of the "protective custody" of the government than they had when labor could strike without running any risk of punishment. It will even be good for labor if it stops such exhibitions as that of Lewis in dictating terms to the federal government. By so doing Lewis definitely harmed the cause of labor.

The speedy action in this case (the bill was passed just 2 hours and 12 minutes after the veto message was received) indicates that Congress has reached the end of its acceptance of one-man say-so over labor matters, with frequent sidestepping and readjustment, always favoring this majority group over the country as a whole.

This new independence of Congress continuing, the country may be given a national labor policy and the laws to enforce it. Hence the importance of the War Labor Disputes Act and the methods used to make it a law.

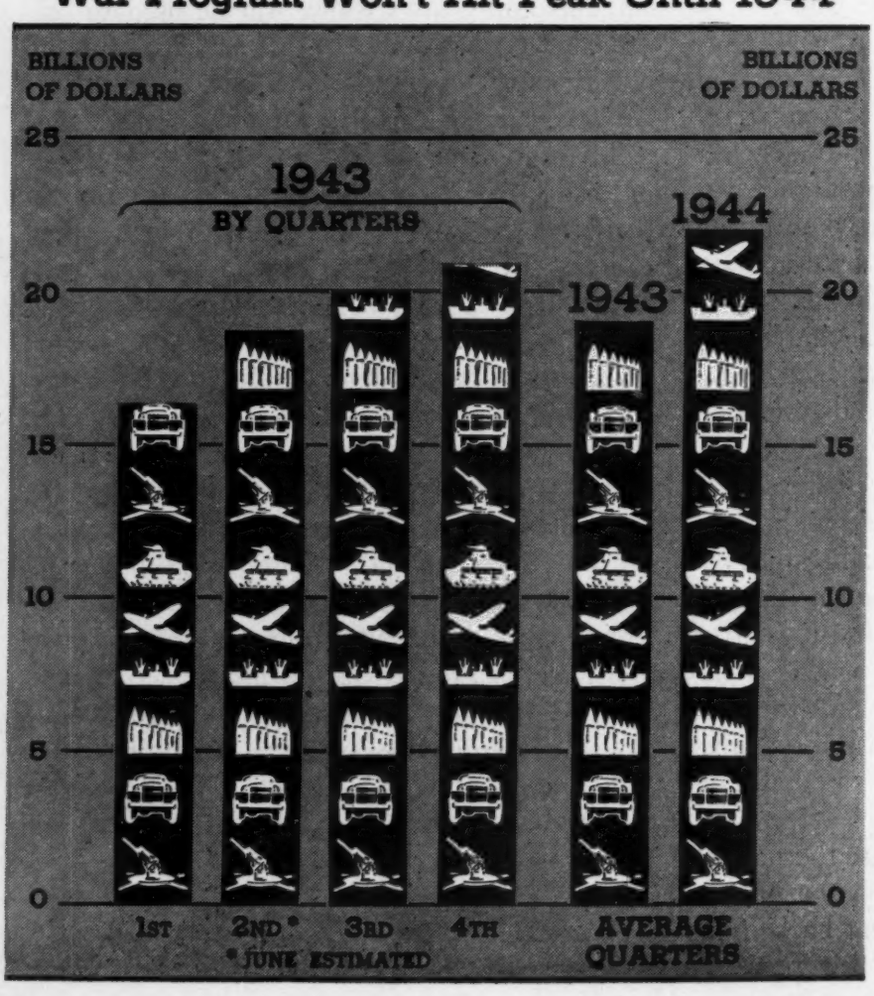
L C Morrow

The Truth About

DONALD M. NELSON

Industry asks: What about cutbacks? Are war contract cancellations causing widespread shutdowns? To get at the facts, *Factory* went straight to Donald Nelson for a frank report on the situation as he sees it. Then, in cooperation with U. S. Chamber of Commerce, *Factory* checked with observers in key cities (see pages 86 and 87)

War Program Won't Hit Peak Until 1944



There is little chance of slack-off in war output if this *Factory* chart is correct. Officials believe these estimates are, if anything, too low

THE CUTBACK QUESTION has recently been a cause of widespread discussion and considerable concern. It is easy to see why both management and labor should be puzzled and disturbed by the paradox of shutdowns and unemployment in the midst of all-out war production.

The chief cause of concern, however, is probably not so much the actual cutbacks that have already occurred as the speculation about future cutbacks and their effect. Industry, we know, wants no sugar-coated optimism from Washington on this point. And industry can "take it" even when the prospect is not wholly pleasing.

So industry asks, and rightly: "What are the facts?"

It would be easy indeed to take one set of known facts and write a reassuring article in the Pollyanna vein. It would be equally easy to take other known facts and write a gloomy and discouraging forecast. The actual outlook shapes up in about this way:

1. The great majority of manufac-

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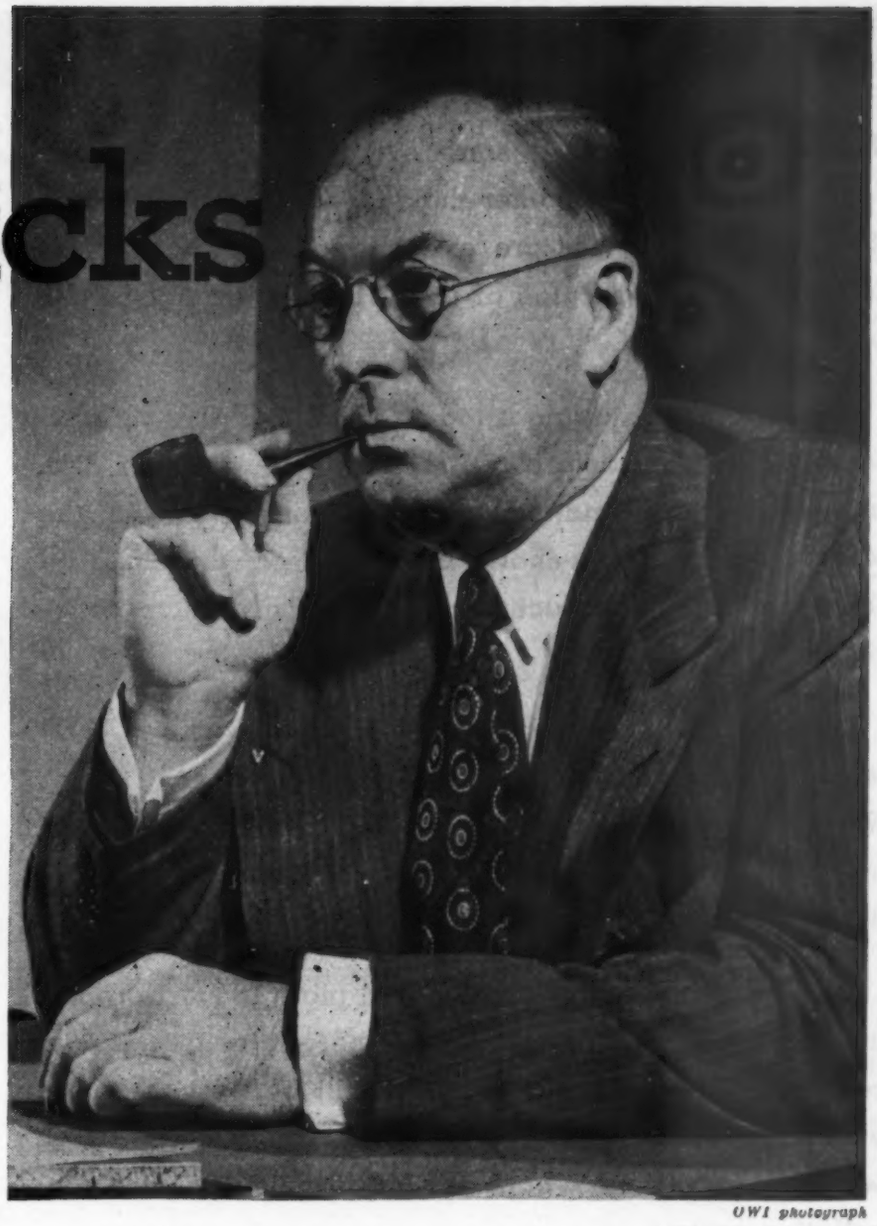


OWI photograph

"No over-all curtailment," predicts WPB Chairman, "but on the contrary an impressive rise above current levels which is scheduled to continue into 1944"

turers will continue to produce at top speed without interruption.

2. A substantial minority will have to undergo readjustments involving redesign, rescheduling, and, perhaps, temporary cessation in production.

3. A very, very small minority may be forced wholly or partially out of the picture.

This forecast applies to manufacturing companies rather than to labor generally. We have no precedent for supposing that widespread unemployment can exist in a nation engaged in modern warfare. The Axis nations are reaching frantically about for more captive labor. There is hardly a pair of idle hands in all England or Russia. And in America, despite cutbacks that have already taken place, total employment is climbing constantly and will continue to climb as long as the war goes on.

While no official estimates are available or possible, I am willing to state, as a personal, unofficial opinion, that less than 30 percent of the total program which we have undertaken will be affected by cutbacks or changes of any sort.

The specific effect of cutbacks on individual companies, however, is admittedly more difficult to foresee. To begin with, the character of cutbacks is not dictated by any agency of the government. It is dictated by the Axis, by circumstances, and by fate. Only in the pitch of battle can the effectiveness of our weapons be tested against those of the enemy. Only in action can we ascertain whether our attrition of munitions is in excess of, or below, the estimates set by the armed services.

For example, in the Tunisian campaign we lost only about half of the planes we thought we would lose. Let's hope that every one of our other estimates has erred in the same direction. Who would have it otherwise? Yet we can't be sure, and so it would be folly to relax. Thus it must be assumed that we shall "put the heat" on production right down to the day when the last Axis stronghold has collapsed. And that, obviously, won't be tomorrow.

Now, in estimating the outlook for manufacturing companies, let us take account of the following features:

1. The over-all war program has not been cut back—quite the contrary (see chart on page 82) in view of which it is hard to conceive of any large quantity of idle facilities.

2. Industries can shift from one kind of war production to another. The success with which such "reconversions" have been accomplished indicates that they can be repeated on a wide scale.

3. Industries can shift back to essential civilian production wherever

For many industrial plants a second conversion is ahead. They will retool, and to some extent re-equip, to manufacture war products other than those they are making. The demands of war are ever-changing. A scarcity of today may be a surplus of tomorrow. Or it may be the other way around.

The old job of hunting is to be renewed. Prime contractors and subcontractors will search for each other and, in cases, with but indifferent success for a time. But the work will be there, as shown by Mr. Nelson's article. And the individual manufacturer must assume the responsibility for locating it.

Local WPB offices may be able to help some, but WPB is not an order-placing agency. The buyers are the Army, Navy, and Maritime Commission. To them the prime contractors must look. So must the subcontractors when they don't know the prime contractors.

Now is the time for the individual plant to start preparing for the second conversion, if there is evidence of a coming change. The war effort will be best served if every manufacturer is ready to take on his new work without loss of time when, as, and if his cutback or cancellation arrives.

L. C. Morrow

the need is justified, and wherever materials and manpower are available. For example, locomotive plants, which learned to make tanks, can go back to making locomotives. Some of them are doing so now.

4. A cutback in the contracts placed with one company may frequently mean an addition to the backlog of another company. Some companies were necessarily overloaded with contracts because their facilities were the only ones which, at the time, could do the required work. Reallocation of contracts will make it possible to equalize backlogs, at the same time increasing the production of items that are needed.

5. A great many of the cutbacks of which we have heard are "paper cutbacks." That is, they simply represent a realistic revision of our over-all aims. They never did take the form of contracts actually issued or orders placed. For example, if at the beginning of the year, we had thought it possible to produce $110,000,000,000 of war goods in 1943, we would have scheduled that amount. But we knew that the limitations of time and materials would make that impossible, so we set a goal in the neighborhood of $80,000,000,000 which can be met only by the most determined effort.

6. The cutback in new plant construction constitutes an additional assurance of continued business for existing producers. But it means that the facilities for expanded production of items which would otherwise have been made in the proposed new plants must be found in existing plants.

7. The construction of planes and ships, which together constitute a decided majority of the total program, will be pushed to the utmost limit of capacity. The most significant cutbacks and design changes will fall naturally into the category of ground arms and ammunition. For example, there has been a pronounced reduction in tank construction. This, incidentally, has probably been the greatest single cause of apprehension in industry. It should be remembered, then, that the entire tank program as initially scheduled constituted only 6 percent of the over-all program. Moreover, the tank cutback does not mean that we shall cease making tanks altogether or that tank plants cannot be turned to other military as well as civilian uses.

This same principle will apply to other types of production as the tests of battle reveal need for better designs—and new weapons.

It is easy to overestimate the extent to which cutbacks and other changes may affect industry. Manifestly, less than 30 percent of the total program can possibly be affected by cutbacks or changes of any sort. By this I do not mean to imply that 30 percent will be so affected; I am simply stating the outer limit of the area in which some sort of change in production (not necessarily a drastic change such as would involve retooling or shutting down of facilities) may take place. Actually to date, drastic changes have affected less than 2 percent of the over-all program.

8. We are thus entering a new phase of the war production program which, to an extent, will resemble the period of conversion that followed Pearl Harbor. How drastically this will affect manufacturers who are forced to take on new kinds of contracts or retool for new designs will depend again, partly on how well the government handles the scheduling job, and partly on management's al-

Cutback in tanks has been biggest single cause of apprehension. But tank program as initially set up was only 6 percent of over-all job. Also, cutback does not mean complete cessation of production

ready demonstrated ingenuity and determination to get and do the work.

9. We must face the fact that the subcontractor will often be the one who must scramble the hardest. It is he who may be forced most often to make his new connections in some entirely new line of production. But he will be aided by the fact that appropriate prime contractors will be looking for him just as hard as he is looking for them. And both will have this advantage:

The government knows a great deal more about the location of facilities than it did a year ago at this time. WPB will bear down on this type of activitiy and will increase the already large proportion of its personnel engaged in facilities work. With it all, I will not deny that a few companies may find reconversion completely impossible, and I want to be on record as having faced this fact realistically. But the national interest demands that all practicable facilities be used, and we are in a much better position to see that they are used today than we were a year ago.

Three major forces will be at work in changing the pattern of industry's operations in this new period of transition. First and foremost is the necessity for getting the greatest and best production of needed items out of existing facilities. Second is the necessity for revising the designs of munitions items in accordance with performance reports from the field of battle. Third is the necessity for resuming production of some of the woefully needed parts and products required to maintain the essential civilian economy. When we say "civilian goods" we distinctly do *not* mean luxury items. The outlook for manufacturers of luxuries is no better than it ever was unless they can be converted to production of necessary things.

These three forces will operate continuously: (1) To intensify the search for idle tools; (2) to increase the "swapping" of facilities, contracts, and even plants; and (3) to stimulate subcontracting.

Let us examine a few examples of the ways in which these changes have worked already. They may give you some idea of the way in which they will work in the future.

The $5,000,000,000 cutback in the ordnance program created a great deal of idle plant capacity at a time when a step-up was needed urgently in valves, gears, bearings, and ships for the Naval construction, rubber, and aircraft programs. Within 90 days WPB's Facilities Division had reallocated $1,500,000,000 in airplane and escort vessel contracts with 160 prime contractors and major subcontractors. Here are some of the ways in which it was done.

Second Conversions

A New England company switched from remote control systems for guns to telescope mounts. Another switched from recoils to plane struts. A Pennsylvania firm changed over from ordnance parts to the rough machining of roller bearings. In St. Louis an automotive parts maker went from fuses to subassemblies for airplane carburetors. A shell factory got orders for pumps. A company in Indiana completely filled the capacity thrown open by the ordnance cutback with orders for spare parts and aircraft gears. In California an entire plant changed from tank to plane engines.

In other fields significant changes like these have occurred:

A vacuum cleaner company had contracts for plane turret motors that were well below its peak capacity. Contracts for turret motors were therefore taken from other companies capable of manufacturing much-needed amplidynes and given to the vacuum cleaner plant. Thus its facilities were more fully utilized and the other plants were able to concentrate on amplidyne production.

Pratt & Whitney wanted increased production of a new propeller shaft. A New Jersey firm had a shop set up to make guns for Army Ordnance. This shop was running at only a small percentage of capacity, and had the facilities to make the propeller shafts. In Cleveland, meanwhile, another company, also making guns for Army Ordnance, had just taken a heavy cutback. It became apparent that if

the New Jersey plant could be relieved of its Army contract, it could handle the propeller job. Result: The Cleveland plant got the ordnance contract, and the New Jersey firm took over the propeller contract. The deal resulted satisfactorily to Pratt & Whitney, Army Ordnance, and the Air Corps, and it was accomplished by the use of existing capacity.

A good part of the coming transition will stem from the effort to avoid further plant expansion. Manpower is likewise a factor. A Detroit company was operating seven plants, making airplane assemblies and shell cases. When the step-up came in the wing program, the management reported that it could handle the expanded schedule only by the addition of 6000 employees. This, in the "tight" Detroit manpower situation, seemed undesirable. On WPB's recommendation, the firm transferred all its shell loading operations to a plant in Scranton, Pa., where labor was more available. This done, the company was able to handle its new schedule without placing an additional strain on the Detroit labor market.

More Reconversions

No less than 150 subcontractors, most of whom had been hit in the ordnance cutback, were included in the successful deal by which the Elastic Stop Nut Company stepped up its production from 25,000,000 to 64,000,000 nuts a week. A railroad equipment company was making ammunition, but neither its facilities nor its personnel were being utilized to the utmost. The ammunition contract was shifted out and a $100,000,000 contract for central fire control stations for heavy bombers was moved in. In this case some plant expansion was necessary, but it amounted only to $3,000,000 or 3 percent of the contract price.

A machine company was building 16-inch coast defense guns. Its forging, casting, and machining capacity, was deemed more suitable for making extrusion presses for the aluminum program. So the gun program was deferred and the plant was put to work on an order for presses which, during 1943, will provide aluminum extrusions sufficient to supply 2000 heavy bombers.

Now to sum up: To the best of our present knowledge there will be

FACTORY'S SPOT CHECK ON

FACTORY, in cooperation with the U. S. Chamber of Commerce, recently sent telegraphic inquiries to experienced observers in key industrial cities to ascertain the effect of war contract cancellations and cutbacks on employment and industrial activity.

Without exception the replies proved to be uniformly encouraging to those who look for continued all-out production for victory.

Spot comment from typical cities follows:

BOSTON. Because of diversified skilled industries, making small parts, arms, radio, and munitions, direct effect of cutbacks and cancellations appears slight. Shipbuilding and aircraft engine and parts plants are increasing production. Tool industries may experience some let-up during conversion to other war contracts. Most new plant facilities completed. War Manpower Commission warns New England it must replace 290,000 workers drawn into military service in 1943 while increasing industrial working force by 238,000.

HARTFORD. Curtailments not yet reflected in employment totals. Lay-offs quickly absorbed. Upward trend noted in aircraft orders. Some slackening of ordnance orders. Machine tool makers report definite drop in new orders and reduced employment in this field is forecast if trend continues. Plastics holding own and textiles booked to capacity for 1943. USES survey indicates Connecticut industrial working force, now at record high, must be increased by 50,000 in next six months.

PHILADELPHIA. Few shutdowns, virtually no unemployment due to cutbacks here. Wide diversity of contracts and no substantial slack-off indicated. Changes in emphasis on contract requirements, such as revision of armor plate specifications, cause some difficulty. Planning for months ahead is often impossible when a contract may be cut back today and accelerated in a few weeks. This complicates manpower problem.

WILMINGTON. No cutbacks and cancellations recorded locally, hence no shutdowns or lay-offs. Increased production of planes, ships, and ordnance limited only by manpower shortage. Wilmington classified as Group One labor shortage area by War Manpower Commission. Industrial leaders, concerned over extra-heavy concentration of certain contracts, fear post-war period may find Wilmington with nothing but shipyards and aircraft plants remaining.

CLEVELAND. No noticeable dent made by cutbacks in industrial volume or total employment. Slight retrenchments in a few plants more than offset by increases in others. Total industrial employment now at all time high of 250,000 and still climbing. Substantial numbers being hired for new bomber plant with many other plants still seeking workers.

CHICAGO. Even after cancellation of $100,000,000 of planned new facilities, including huge synthetic rubber plant, Chicago area has above $950,000,000 in new plants, some of which are not yet completed. Aggregate demands for labor preclude unemployment. The few cutbacks noted so far have made no impact, occurring in plants whose variety of orders permits shifting of labor from one department to another. Example: One plant, cut back on casting orders, switched to

ON CUTBACK CONDITIONS

shell making and reworking of obsolete shells. Another shifted from completed tanks to naval vessels and aircraft sub-fabrications without any lay-off. Increasing rather than decreasing employment expected.

MILWAUKEE. Situation not serious so far. Ordnance Department gradually tapering off work, permitting firms to absorb employees in other war activities in same plants . . . also assigning new items, such as bazooka ammunition, to producers of less-needed products, such as small bombs. Milwaukee chiefly on naval and aircraft contracts with few cancellation difficulties in prospect except for model changes. Outlook is for accelerated, rather than diminished, production pace.

MINNEAPOLIS. No serious shutdowns, lay-offs, or unemployment due to cutbacks or cancellations. Those noted have been largely temporary as, in almost every case, the affected contractors obtained other war work. Recent change from Group Three to Group Four by War Manpower Commission would indicate some unemployment, but this was due largely to curtailment of construction at an ordnance plant, affecting some 5000 construction workers. New plant expected to employ 4000 is scheduled for this area. Do not anticipate serious shutdowns.

ST. PAUL. Two large contracts were cancelled here for important plants to make powder and aircraft engine parts before either property was ready for production. Neither cancellation seriously affected over-all employment situation, however, while construction workers are being absorbed in other jobs. No substantial slack-off foreseen.

MEMPHIS. Some cancellations have come at intervals and have affected only moderate-sized plants, most of which have had reinstatements or have been converted to other work. All large aircraft and ordnance plants working to capacity. Labor on construction projects, about completed, will be absorbed by two new plants on aircraft and engine parts, two new chemical industries, and large aircraft depot just going into production. Anticipate continued balance of labor supply in 1943.

ST. LOUIS. Cutbacks and cancellations have not yet materially affected war production in this area. Employment increasing and unemployment down to vanishing point. Only one plant, and that not large, seriously affected by shift in tank program. Rumors frequent but do not anticipate any great dislocation of industry in near future. Prominent in local picture are essential civilian industries—food, clothing, shoes —all operating at a high rate.

LOS ANGELES. Cutbacks have not been a problem in Southern California. Some reduction in military construction and ordnance with occasional temporary shutdowns. Tremendous activity in planes, ships, petroleum, and quartermaster supplies has made it possible for ordnance producers to shift over to subcontracting in these fields. Tank production here was never large, and plants in tank production have maintained even level.

SAN FRANCISCO. Cutbacks and cancellations not a problem here. At present it appears they will not be, except in isolated cases. Labor shortages, however, may eventually cause some procurement diversion.

no over-all curtailment in the production of munitions for 1943, but on the contrary an impressive rise above current levels which is scheduled to continue into 1944 with a rise, in the field of munitions proper, even above the peak rates set for the end of this year. This will be accomplished chiefly through the diversion of effort from the construction of facilities to the turning out of combat munitions. Any increase in the flow of resources to transportation facilities, industrial maintenance and operation, agricultural equipment, and the like, will be undertaken only as it becomes necessary for the effective prosecution of the war and for no other reason.

Full Speed Ahead

Here is another important point. We shall have more steel this year than ever before—92 million ingot tons. We shall see to it that every pound of it is cut up, utilizing every available facility to do so, whether it takes the form of guns, ships, tanks, farm implements, or railroad equipment. So we shall, because we must, keep our plants and people busy at top speed. Nevertheless, I think we *should* worry about cutbacks. We should worry constructively, just as we worried about conversion, materials, manpower, and smaller war plants. None of these problems actually stopped the production program, and I think one reason is that a lot of intelligent worrying was done about them by the armed services, by WPB, and by industry. No one has done a perfect job, to be sure, but everyone has done his level best. So let us begin worrying now and prepare as best we can to meet the problems that lie ahead.

Recipe for Success

Industry's magnificent production record is now reflected in the growing success of our armed forces. The job isn't finished by any means, but we know today that we will smash the Axis with the most brilliantly equipped fighting forces ever assembled by man. One of the chief reasons for our success has been American management's ingenuity, resourcefulness, and determination to produce. These are the very qualities which will pull this national of ours through the coming problematical period.

Jobs After the War

A Series of Articles on Post-War Employment Problems

INTRODUCTION

Herewith *Factory* undertakes a new commitment. Under the heading, "Jobs After the War," this magazine will report on significant developments in the growing national effort to insure a prosperous peace for a victorious America by providing post-war employment to the nation's labor force.

Logically the problem of first importance will be the reabsorption of those who have been temporarily subtracted from the domestic economic picture by virtue of their service in the armed forces.

This series is in line with *Factory's* practice of giving its readers full information on topics of continuing interest to management. Examples include the *Factory* War Communiqués and the several series on such subjects as manpower, the Controlled Materials Plan, Manning Tables and Replacement Schedules, scrap salvage, and conversion.

1. REEMPLOYMENT OF VETERANS

IF POST-WAR PROSPERITY is to be achieved, some 56,000,000 Americans will have to have jobs. That is the considered estimate of the Committee for Economic Development.

The key piece in the puzzle will consist of the 11,000,000, more or less, who will return from service in the armed forces. How well the whole national reemployment job will be done may depend primarily on how smoothly, how quickly, and with what initial accuracy these veterans can be fitted into the post-war pattern.

The right of veterans to return to their pre-war jobs has already been promised by Congress in a declaration of governmental policy so positive (though far from clear in detail) that any modification of it would be hard to imagine.

Extensive machinery has already been set in motion to make good on the Congressional promise. Yet it is probable today that: (1) Not all employers are fully aware of their obligation to restore servicemen to their jobs under the law, (2) few Americans are familiar with the broad program already under way not only to enforce this law but to also guide returning servicemen back into useful positions in civilian life.

The Reemployment Division of the Bureau of Selective Service is the agency charged by Congress with enforcement of the veteran's legal claim to his pre-war job and with the larger task of directing and coordinating efforts to restore the serviceman to a self-sustaining role in the home community.

Much more will be heard, before long, of this agency and of the national network of Clearing House Committees of citizens, who, in every city, town, and village, will greet the returning veteran and help him to find his place in the domestic pattern. Much more, too, will be heard of Vocational Rehabilitation Division of the Veterans' Administration.

What the Law Says

Federal policy on the reemployment rights of veterans was enunciated by Congress in the Selective Service Act of 1940. Section 8 of the Act, as amended in 1941, contains the passages that employers should study.

Subsection (a) of Section 8 provides that men discharged after military training and service shall be given certificates including a record of spe-

cial proficiencies or merits attained, plus medical statements showing any illness, injury, or disability sustained while in service.

Subsection (b) declares:

"In the case of any such person who, in order to perform such training and service, has left or leaves a position, other than a temporary position, in the employ of any employer and who (1) receives such certificate, (2) is still qualified to perform the duties of such position, and (3) makes application for reemployment within 40 days after he is relieved from such training and service—

"(A) [*omitted because it applies to employees of the U. S. Government*].

"(B) if such person was in the employ of a private employer, such employer shall restore such person to such position, or to a position of like seniority, status, and pay unless the employer's circumstances have so changed as to make it impossible or unreasonable to do so;

Subsection (c) declares:

"Any person who is restored to a position in accordance with the provisions of Paragraph (A) or (B) of Subsection (b) above shall be considered as having been on furlough or leave of absence during his period of training and service in the land or naval forces, shall be restored without loss of seniority, shall be entitled to participate in insurance or other benefits offered by the employer pursuant to established rules and practices relating to employees on furlough or leave of absence in effect with the employer at the time such person was inducted into such forces, and shall not be discharged from such position without cause within one year after restoration."

The law further provides—in Subsection (d)—that private employers who fail or refuse to comply with the above provisions may be compelled to do so by the Federal District Courts and can thus be made to compensate "for any loss of wages or benefits" suffered by the returning employee, if the court finds he has a right to them.

The law is quoted at length above for the benefit of those who wish to study its language closely. Summed up, the salient features of Section 8 are these:

1. Employers must, if they can, restore employees returning from service to their old jobs or to jobs of like seniority, status, and pay.

2. Employers must maintain insurance and other benefits for employees in the service in accordance with the terms prevailing at the time of their departure.

3. Servicemen must, however, apply for reinstatement in their jobs within 40 days after their discharge.

4. Employees rehired under the terms of the law cannot be discharged without cause for one year.

5. Employers can be compelled by the courts to make amends for violation of the law.

What the Law Doesn't Say

The intent of Congress—which was to give the serviceman every possible reassurance—is abundantly plain in the law quoted above. In its specific provisions, however, the law is extremely vague on some important points—necessarily vague, perhaps, since the law was enacted in the atmosphere of uncertainty preceding Pearl Harbor when both government and public were hoping and pretending that there would be no war.

Much of the law's practical meaning, therefore, was left to be determined in the manner of its enforcement, in the regulations, policies, and precedents developed in the course of enforcement, and, eventually, perhaps, by some Congressional clarification.

A fair body of precedent has already been formed by the operations of the designated enforcement agency, the Reemployment Division of Selective Service. Thus answers may already be supplied—or at least hazarded with reasonable accuracy—to some of the questions which employers will naturally ask. For example:

1. Does the law apply to WAACS, WAVES, and the like?

It does, definitely, and also to SPARS, Marine Corps Auxiliaries, and to commissioned officers, male and female, of every branch of the Army or Navy—in fact, to all members of the armed services whether voluntary or inducted.

2. How is a "temporary" employee defined under Subsection (b) of Section 8 of the Selective Service Act? (This is important because the law relieves employers of the obligation to reemploy temporary employees.)

Some progress has been made with the interpretation of this rather fuzzy provision of the law. Selective Service has generally applied the yardstick of common sense to the definition of "a position other than a temporary position," the character of which can usually be ascertained by an employer's records and an employee's testimony.

Here is one highly important point, believed by officials to be insufficiently understood both by employers and employees, which is emerging from current interpretations of the law:

The only employee whom the employer has an obligation to reemploy is the first man who held a given job before entering the service; any employee hired to replace the first employee is a temporary employee without claim to reinstatement under the law.

Officials believe many employers have failed to explain this fact to men hired as replacements for servicemen with the result that much misunderstanding may develop which will cause trouble, both for employees and the government, later on.

3. Has Section 8 been put to any practical test as yet?

Yes, again and again, but only in informal negotiations between employer, employee, and enforcing officials. In only one instance has anything resembling real legal action been taken. Yet the law's validity has been greatly strengthened by the precedents that have been set in informal enforcement

In one of the most significant pre-Pearl Harbor tests, for example, a "wildcat" strike was threatened. The man who sought reinstatement under the law had been in the armed services only a few weeks when he was discharged because of a minor physical defect. Before leaving, this man had been extremely unpopular among other employees in the plant and had held a choice job at a highly productive and profitable machine under circumstances that brought charges of favoritism. When he sought reinstatement in the same job, a spontaneous walkout started among local union members in the plant.

Despite the tension surrounding the case, Selective Service upheld the reinstatement claim and was, in turn, upheld by international officers of the union who ordered a stop to the strike.

The case was then placed before the men who had been on strike by officers of National Headquarters of the Reemployment Division and the local Reemployment Committeeman, and their decision as sound Americans asked. The men themselves immediately agreed to the reinstatement

of their unpopular mate in his job. The case, as a test of the law, was entirely clean cut. The applicant had fulfilled every condition of the law, and there was no question of the employer's ability to provide the job. The case is cited as an example of the evenhanded seriousness and vigor with which the enforcement of the law has been undertaken from the start.

If the outlines of every reinstatement case were as simple as that one, however, there would be no questions left to be asked about the law's broader applications. Unfortunately, many questions remain.

4. What are the most indefinite features of Section 8?

One is the definition of "like seniority, status, and pay." Does it mean seniority and pay "frozen" at the time of the employee's departure or does it include seniority accrued and pay increases enacted during the employee's absence? A long war will make these questions even more important than they are today.

Selective Service has already taken the position officially that the law "was intended to conserve to employees any right or benefit based on seniority which would have accrued to them had they remained in their civilian positions during the period they are in military service."

Many union contracts, especially those written since Pearl Harbor, have been phrased so as to make more specific than the language of the law itself the returning employee's right to accrued seniority and pay increases. Other contracts have begged the question by simply inserting the language of the Act.

Another puzzling provision of the law centers around the "circumstances"—Paragraph (A) of Subsection (b) of Section 8—of an employer and the way in which they can "have so changed as to make it impossible or unreasonable" to provide employment to a returning serviceman under the law's terms. This may look, at first glance, like a rather large loophole. Many qualified students of the question and some officials (off the record) urge a closer look at the facts, however. The whole problem is still largely in the realm of speculation, to be sure. But—

"To be perfectly realistic, it is hard to imagine any way in which Congress might clarify or any post-war government official might interpret this—or any—part of the law which would not lean heavily in the veteran's favor," one of FACTORY's sources pointed out. Another well-informed observer, questioned on hypothetical cases, gave as his opinion this forecast of the law's probable application:

"In the mushroom 'war baby' type of plant, built for war purposes only and shut down at the war's end, the obligation to reemploy will probably vanish with the job itself.

"As for the established company which simply expanded its personnel within its regular facilities during the war, the management will probably find itself obliged to reemploy its veterans to the very extent that it is able to employ anyone at all. That is, if it can provide work for only 500 employees all told and 500 of its servicemen return with legitimate claims to reinstatement, then it will have to give the servicemen first call on the jobs—even if this means discharging old, permanent, pre-war employees with greater seniority."

If anything like this were to occur on a large scale, the resulting bitterness would not be hard to imagine.

Yet it would be hard to imagine 11,000,000 servicemen (every one of whom has heard of the period following the first World War) meekly permitting themselves to be dumped, jobless, into the streets.

Stated in its most extreme form, here is an arresting thought which is hard to shrug off when the visible facts are contemplated:

If the nation were to find itself with only 11,000,000 jobs at its disposal, those 11,000,000 jobs would almost surely be filled by veterans of the second World War.

They will have, for one thing, a moral claim to preference which a grateful nation will acknowledge.

And they will have, as no band of veterans before them has ever had, the political power to enforce that claim.

Thus it must be asumed that this war's veterans will get jobs—at the cost, if need be, of no matter what pressure and disruption.

This granted, what is the alternative?

First, even if the war were to end quickly, it is presumed that the authorities will not suddenly muster men out by the millions, leaving the domestic economy to struggle with large, unassimilable masses of manpower. Instead, it is generally believed, servicemen would be fed back into civilian life on some gradual, systematic basis.

An equally fundamental answer will lie in early action, on a voluntary, cooperative plane, to arrange for the orderly reabsorption of veterans in the home community.

Fortunately the concept of early, voluntary, cooperative action appears to be that held by the Reemployment Division of Selective Service.

In the enforcement of Section 8, the Reemployment Division has striven to interpret the law in a fair and liberal, rather than a stiff-necked and legalistic manner. The spirit of the law has been honored in the enforcement with such scrupulous care that the right of any serviceman who has a just claim to its protection has been greatly advanced thereby. At the same time, the claims of servicemen against employers have been fully investigated and, if found unwarranted, rejected. By negotiation and mediation, the Reemployment Division has accomplished far more than it might have, perhaps, by frequent resort to law. Employers have been cooperative moreover. In only one instance, that of an exceptionally obstreperous employer, has legal action of any kind been authorized from Selective Service headquarters. And in that case the employer promptly reinstated the serviceman with back pay of some hundreds of dollars when informed that the United States Attorney had prepared a case for court action.

What Is Being Done

This concept of voluntarism inspired the Clearing House Committee program through which, by community teamwork, the task of steering returning servicemen back into useful and productive civilian pursuits will soon be undertaken on a national scale.

A National Clearing House Committee, already in existence, will be followed this month and next by the creation of state and local committees of voluntary, unpaid community leaders representing management, labor, and civic groups.

In the creation of these committees, Selective Service is looking beyond its first objective, the enforcement of Section 8, to the much larger job into which the first will eventually merge —that of reintegrating all veterans in the civilian community.

It should be noted that Section 8 itself will be a matter of diminishing importance in a really long war, for three reasons: (1) Fewer veterans will wish to return to their old jobs, having, in some cases, outgrown them, and having, in other cases, acquired new skills to qualify them for better jobs; (2) fewer employers will be in any reasonable position to comply

with the reinstatement law; (3) more veterans—battle casualties, shell shock cases, and the like—will require special guidance and rehabilitation.

Well over 500,000 men have already been returned to civilian life from the armed services, but their reemployment has not been a major problem up to date. Even though ex-servicemen are currently moving back into civilian life at a rate of about 6000 a week, others are moving in the opposite direction—into military service via Selective Service—at 10 times that rate. Thus the great majority of returning servicemen have found jobs for themselves without difficulty in the manpower market of today.

Not Too Soon to Plan

Among the men mustered out there have been, until now, few actual battle casualties. Nearly all of them, in fact, have been discharged as unsuitable for military service because of age or because of physical or psychological defects. Larger numbers of hospital cases may be expected henceforth, however. And it is not too soon to plan for large-scale reemployment not only of the disabled but also of those no longer needed in the services.

Hence the Clearing House Committees. They are the logical extension of an existing set-up. In nearly every community, the representatives of three government agencies are already operating exclusively in behalf of the returning veteran: (1) The volunteer Reemployment Committeemen, representing the Reemployment Division of Selective Service and attached to each Selective Service Local Board; (2) the representatives of the Veterans' Employment Service of the United States Employment Service, full-time specialists; (3) staffs of local agencies of the Veterans' Administration.

Currently there are between 2 and 20 volunteer Reemployment Committeemen for each Local Board. Eventually there will be one for every 20 or 30 veterans. The task of these committeemen is to greet the returning serviceman, handle his records, sort out the red tape for him, and act as his friend and agent either in regaining his old job or finding a new one. This personalized sort of service gives the veteran the feeling that he has a friend in his home town and that he is something more than a number or a "case" to be channeled through rigid routines.

The volunteer Committeeman maintains close contact with the Veterans' Employment Service, a long-established agency originally set up to assist veterans of the first World War. Both the Selective Service Committeeman and the Veterans' Employment representative operate through the United States Employment Service with its 1500 branch offices. All three currently are adjuncts of the War Manpower Commission, a war agency. It is expected that USES and Veterans' Employment will survive in the post-war period as the permanent job-finding agencies.

There is nothing official, however, about the Clearing House Committees. Not a single official of the United States government appears in their membership.

These committees have no assignment except to help get veterans to work in suitable, advantageous roles in the most effective and harmonious possible way. The committees will get no orders from Washington.

The National Clearing House Committee was organized at Chicago in October, 1942. Lawrence J. Fenlon of the American Legion was named Permanent Chairman. At Indianapolis in May, the committee laid the groundwork for the national system of state and local committees which will begin operation this month and next.

The national organizations that participated in the formation of the National Clearing House Committee are: American Steel & Iron Institute; American Farm Bureau Federation; American Federation of Labor; American Legion; Chamber of Commerce of the United States; Junior Chamber of Commerce of the United States; Congress of Industrial Organizations; Disabled American Veterans; Kiwanis International; Lions International; National Association of Manufacturers; National Exchange Club; National Grange; National Industrial Council; Rotary International; Veterans of Foreign Wars. The four Railroad Brotherhoods are being invited to join.

Local representatives of these bodies will serve on the local committees, aided by members of civic and fraternal groups not included in the major committee.

Three Major Objectives

When the local committees are set up and ready to go, they will have these major objectives: (1) To review reinstatement claims presented by Selective Service Reemployment Committeemen on behalf of veterans and to attempt to adjust these claims without bickering or resort to legal action; (2) to study special cases and attempt to find jobs for veterans whom Selective Service and Veterans' Employment have been unable to place through USES or other regular channels; (3) to advertise to the community generally the virtues of servicemen as prospective employees. And, when the going gets tougher and jobs become scarce—"... it will be the function of the Clearing House Committees," says National Chairman Fenlon, "... to see that this load is distributed equitably among all employers in their community and that the generous are not overloaded nor that the small of spirit escape their share of the load, and that the distribution of jobs shall be handled without discrimination or favoritism."

Still another task which the committees may take on in time will be the reemployment of civilians displaced by servicemen under Section 8. This would go far to avert some of the abrasions which ruthless enforcement of the law may engender.

Additional Help

Other agencies concerned in the reemployment and rehabilitation of veterans, who will participate in community work, are the various state Vocational Rehabilitation services, and the Red Cross. The latter investigates hardship cases affecting veterans and their families, gives aid where it is not otherwise provided, and fills in chinks generally. In the hospitals where convalescent veterans await discharge, the Red Cross also interviews them and acquaints them with the reemployment and other government services which are available to them at home. The Veterans' Employment Service, incidentally, is organizing a corps of interviewers to visit all veterans at the hospitals, gather data on their qualifications and job preferences, provide vocational guidance, and make preliminary arrangements for necessary training. Some of these interviewers are already active in naval hospitals.

A curious sidelight on the whole program is the frequent reluctance of the veteran to avail himself of the facilities, governmental or otherwise, created for his benefit.

"With the self-reliant nature developed by the soldier and his habit of digging himself out of difficulties by his own efforts, he is prone to ignore all machinery set up for his use by the government until he is in desperate circumstances, when the task of helping him is far more difficult," Chairman Fenlon points out. "Many of his opportunities have been lost and he himself gets into a frame of mind that is an actual barrier to his own success."

A big problem is that of keeping

track of the returning veteran. Often the 40-day period required for notice of his desire to be reinstated in his former job has passed by the time he reappears on his home doorstep.

Machinery is now being perfected through which the home authorities will be notified of the approach of a man discharged at some distant post, base, or hospital. His non-appearance will then be noted promptly and a search for him begun. Great improvements have also been made (a story in itself) by the Selective Service Re-employment Division in the simplification, transmission, and centralization of data concerning the serviceman, his records, his qualifications, and his education, for exchange among the cooperating agencies.

The serviceman's independence of spirit, officials believe, should appeal to prospective employers as a desirable attribute—nor is it the only one. He is also the recipient of the vast amount of practical and technical education which the armed services are dispensing to men in uniform, partly as a matter of necessity and partly in the interest of morale.

There are, first, the millions who are brushing up on geometry, algebra, trigonometry, and even calculus to improve their ratings by applying such knowledge to their combat duty, whether it be the operation of an anti-aircraft gun, a piece of detection equipment, or even a jeep. It is estimated, incidentally, that five out of seven Army jobs have some counterpart in civilian industry.

Hundreds of Courses

Correspondence courses are given to servicemen through the War Department's Armed Forces Institute not only in technical and engineering subjects, but also, for the sake of sheer self-improvement, in hundreds of other subjects from anthropology to zoology. The extension divisions of 80 major American universities are engaged in this program. Soldiers and sailors who complete the courses (part of the cost of which is borne by the government) receive certificates of proficiency which are entered in their service records. The Clearing House Committees thus will have a third talking point on the advantage of employing veterans in addition to that of character instilled by discipline and a presumably high health standard (save in the case of the disabled).

On the debit side it must be reported that a quite high proportion of returning servicemen have been classed as psycho-neurotics and were discharged for that reason. Most of these, no closer to action than the training camp, developed nervous symptoms that range all the way from nerve-induced stomach ulcers to outright hallucinations.

With it all, the proportion of those discharged from the armed services as psycho-neurotics is not as high as the 23 percent of all candidates who were rejected for military service in the first place because of mental disease, neurological disorders, or mental deficiency. These figures, therefore, may stand forth more as a dismaying commentary on the state of the nation's mental health than as a particular drawback common to ex-servicemen.

Maj. Gen. Lewis B. Hershey of Selective Service, as a matter of fact observed gloomily to a Congressional committee not long ago:

"You take pause to wonder how you can run a successful war. Maybe we are all unfit for modern war. When does that leave us if we must win the fight?"

Officials are quite confident, however, that the factor is not a major one so far as it concerns the reemployment of veterans, 80 to 90 percent of whom, it is believed, will arrive home quite acceptably prepared mentally to resume roles of usefulness in the community.

Plans for Disabled Veterans

The question of the physically disabled veteran, however, is quite another matter. For him extensive machinery is being prepared in the Veterans' Administration to whose stewardship he was assigned by Congress in Public Law 16, March, 1943.

The vocational training and rehabilitation provisions of this law are of interest to industry.

"We anticipate that the disabled veterans of World War II, who may be rehabilitated under our training, may have an advantage over many of those trained after World War I," said Brig. Gen. Frank T. Hines, Administrator of Veterans Affairs, recently, "in that, through the efforts of those interested in veterans' affairs, and particularly the American Legion, a large organization on a decentralized basis has been established and facilities are located throughout the country ready to handle all forms of veterans' benefits."

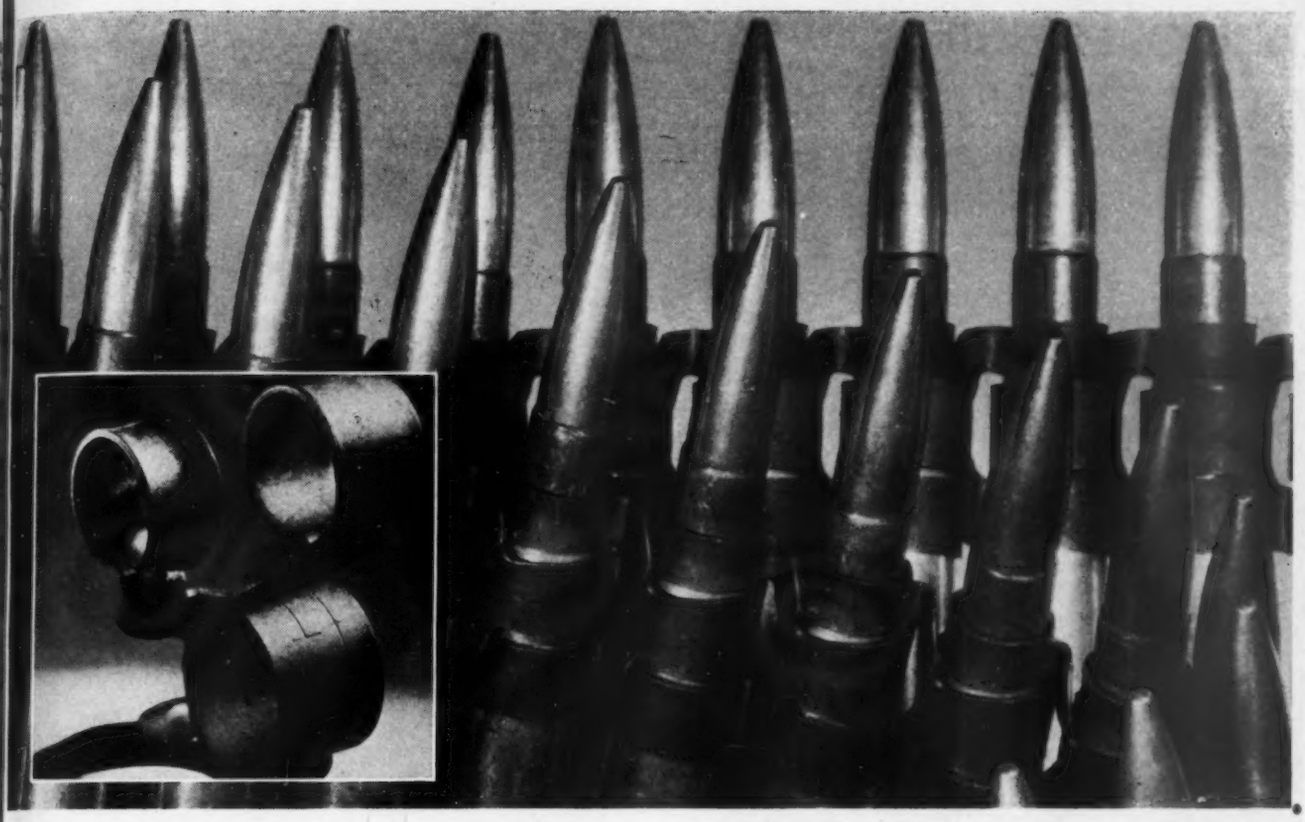
The rehabilitation program will take care of many of the cases of veterans who might be barred from job reinstatement under Section 8 on the ground that they are no longer able to perform their former duties. The program also extends concrete and systematic benefits to men whom the more informal Clearing House Committees could hardly be expected to help in this way.

The law states, however, that "the purpose of rehabilitation is to restore employability lost by virtue of a handicap due to service-incurred disability" and it will not be the policy of the Veterans' Administration to intervene in the case of an employed disabled veteran whose disability does not materially interfere with the work he is doing.

The Vocational Rehabilitation Division of the Veterans' Administration is setting up units in 53 field stations throughout the country. Local Rating Boards will determine the extent and nature of the veteran's disability. Vocational Advisors will assist him in choosing an appropriate trade or profession for which to train. Arrangements will then be made for his vocational education at government expense—for which a pension increase is provided—at the place nearest his home. No course of training is to exceed four years.

Educational institutions, industrial establishments, and farms will be utilized in the program. Contracts will be made with industrial concerns for in-plant training of veterans at government expense. There has been no announcement as yet concerning the relationship of the Veterans Administration set-up with the already-established state rehabilitation and vocational training services.

The second article in the series, "Jobs After the War," is scheduled for publication in an early issue of FACTORY



The product—a .50 cal. machine-gun metallic belt link. Cartridges are used as pins to assemble the belt

Laid Out for Non-Stop War Production

TRUE MASS PRODUCTION is the net result of conversion by Fedders Manufacturing Company, Buffalo, to fabrication of machine-gun metallic belt links, under the Rochester Ordnance District. It has been made possible by straight-line layout whose outstanding characteristic is effective use of mechanical handling equipment. Chutes and conveyors move links from one operation to the next.

This type of equipment is peculiarly adaptable to the handling of a repetitive item in enormous quantities. The compactness of the entire operation is noteworthy, yet there is no crowding.

As in any mass-production operation, output is geared to uniformity. The links are pinned together by the cartridges to make the ammunition belt. A single faulty link could thus jam a machine gun and put a fighting unit out of action. Each and every link undergoes rigid inspection.

SEQUENCE OF OPERATIONS

1. **Press with progressive die** (convey through visual inspection to degreasing)
2. **Degrease** (convey to furnace hoppers)
3. **Harden** (convey from quench to degreaser)
4. **Degrease** (convey to draw containers)
5. **Draw** (unload draw containers into grit blast)
6. **Grit blast for rustproofing** (convey to hoppers)
7. **Rustproof** (convey to centrifuges)
8. **Spin dry** (convey through inspection)
9. **Test for dimensions and spring tension**
10. **Fill cartons and pack** (convey to freight cars)
11. **Load shipment**

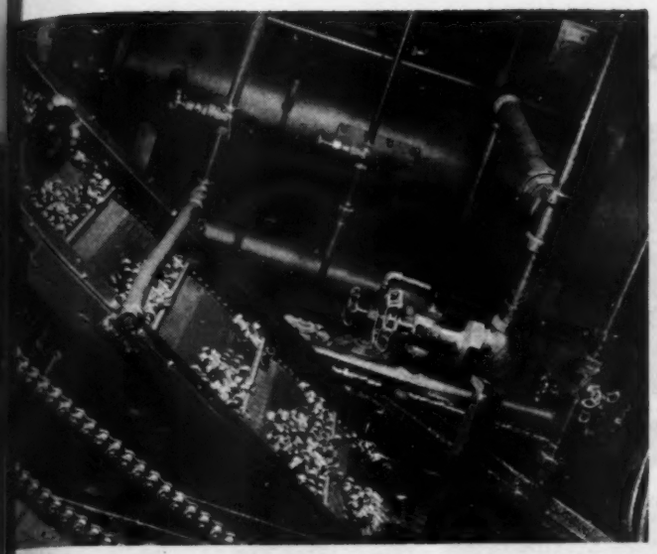
CONTINUED ON NEXT PAGE

Laid Out for Non-Stop War Production (continued)

Initial step in mass manufacture of machine-gun metallic belt links is feeding of strip stock through progressive dies. Links are formed in a single die, and are chuted from the presses to a conveyor belt which moves them directly, without intermediate handling, to degreaser. Each press in the long production line has a telltale light to signal the supervisor when the press is shut down

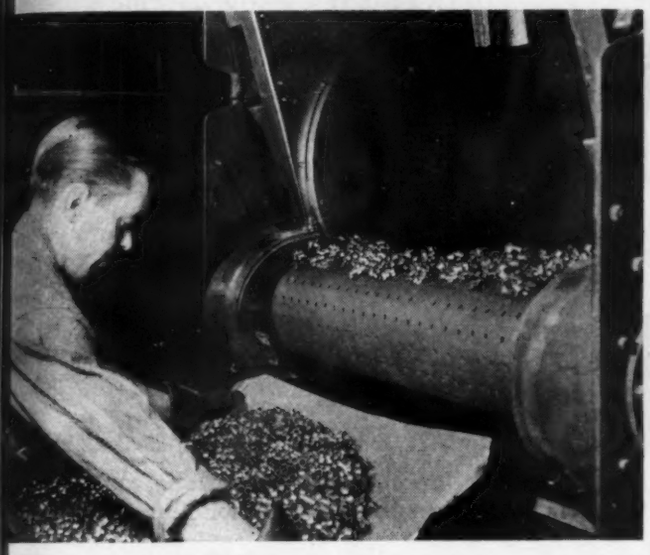
Links are fed automatically from electrically vibrated hoppers into hardening furnaces

Links on the way to degreaser. Conveyor fits into waste space behind the line of punch presses



ed conveyor removes links from quench; another yor moves them to degreaser below floor level

From degreaser via elevator, then chuted into large draw containers handled by electric hoist



roofing is the finishing process. First comes grit ng for fast removal of scale and burrs

Conveyors take belt links from grit-blasting process to hoppers over the rustproofing machines

ed links emerge from rustproofing ready to be con- immediately to the centrifuges

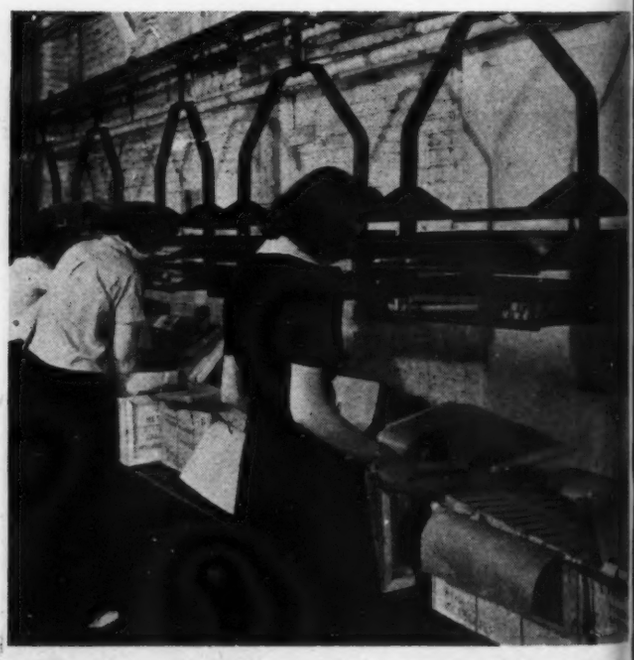
Belt links are chuted into centrifuge baskets, spun dry, then lifted and dumped on inspection conveyors

CONTINUED ON NEXT PAGE

Laid Out for Non-Stop War Production (concluded)

Girls pick links off inspection conveyor and put them through pull test and profile gages. All links are inspected for physical dimensions and spring tension, then move directly to carton-filling operation

Links from each gage ride track leading into cartons, which are taken away by overhead conveyor

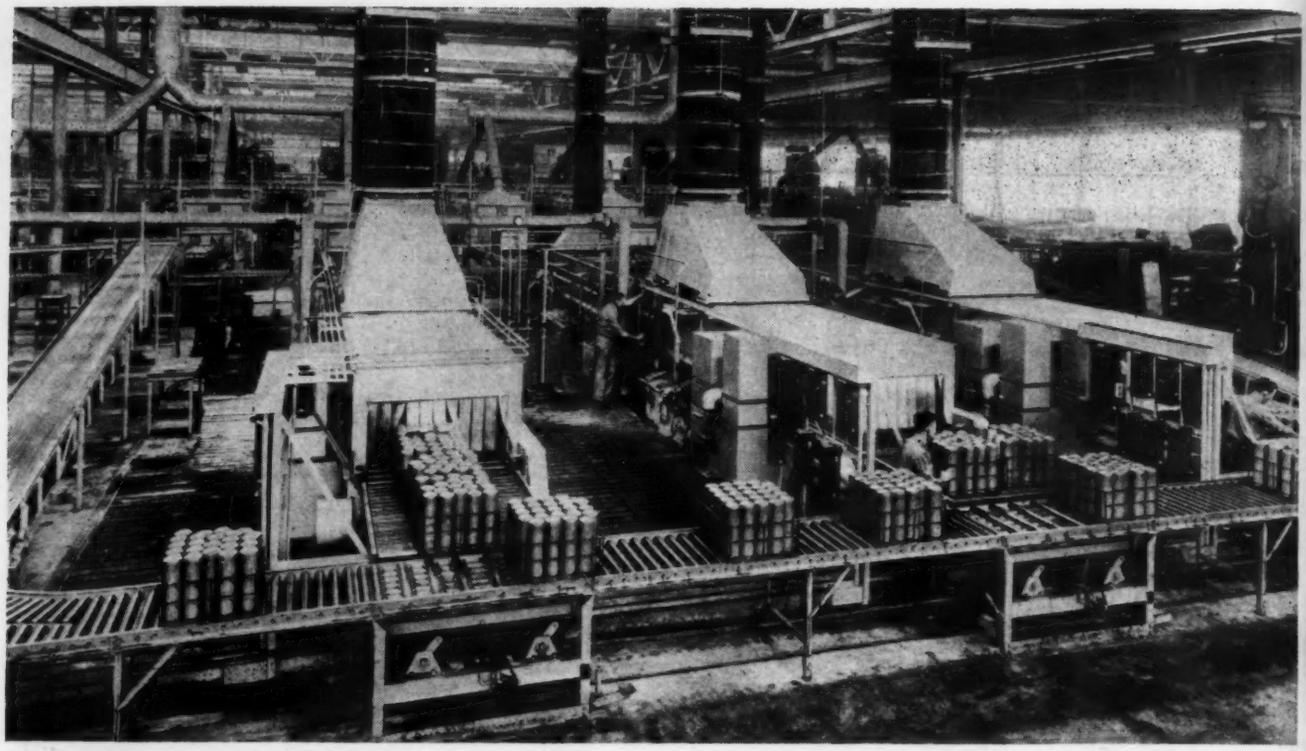


Cartons are lifted directly from overhead carriers to packing cases on a gravity roller conveyor

MATERIALS HANDLING

Better Handling for War Speed, Post-War Economy ▸▸ Yard Moves ▸▸ Through Production ▸▸ On Assembly Lines ▸▸ To Storage ▸▸ Special Jobs ▸▸ Shipping

For description see page 105



Roller and belt conveyors (Mathews) speed output of shell cases, which are shown as they leave pickling and annealing lines. Transfer tables make right-angle changes of direction possible

BETTER HANDLING —for War Speed and P

IF THE ALLIED NATIONS are now basking in the "mellow light of victory"—and Winston Churchill, never one to underestimate the size of the job ahead, says we are —it is because America has in fact as in fiction become the arsenal of Democracy.

It is because American genius for mass production has enabled industry to meet delivery dates on the tremendous rush order it undertook to fill some twenty months ago.

It is because management has made full use of all the time-saving and cost-cutting tools at its disposal.

Still topping the list of those tools is mechanical handling. This is bound to be true because *every* plant has been on speed. It still is. Everything else has been subordinated to the demand for more production. And that demand is being met.

Only the other day the hundred thousandth plane rolled off the assembly line in some one of our huge aircraft factories. This great achievement—and similar achievements could be cited in every branch of our war production—was made possible only because the aircraft plants of this country are making the same sort of use of trucks and cranes and hoists and conveyors that we associate with the great automotive industry we all remember so well.

Two or three short years ago it was a commonplace to assert that mass production methods could not be applied to the manufacture of airplanes. Yet today it is being done. All that the aircraft industry needed was the volume that makes it practicable to tool up for mass production.

And so today in our aircraft plants we find effective use is being made of handling equipment. We find in one plant a veritable network of craneways that cover every square foot of assembly floor. In another, wings are fabricated and assembled in jigs that move slowly but surely down the floor. A number of plants have already mechanized their final assembly lines. Others

Power truck (Yale) is one of a fleet of carriers that are enabling a steel mill to meet its war production promises, and will play a major cost-cutting role in post-war years

Fantastic schedules are being met in shell plants. Here combination roller and pusher conveyor (Alvey-Ferguson) moves shells from paint curing to loading

Post-War Economy

are about to. In every plant power trucks weave in and out with their loads, discharging the hundred and one commissions that constitute their daily duties.

But there is no intent here to single out any one industry. Our purpose has been merely to show how mechanical handling is playing a major role in this great production.

There is another side to the story, too. Emphasis is still on speed. Our greatest need still is to boost war output. But the time has come again when speed of manufacture must be considered in relation to cost—particularly the cost in manpower. And the cost in dollars is becoming important. It is an obligation for management to begin now to look ahead to the post-war years, when speed of manufacture will continue to be important, but when ability to produce at low manufacturing cost will once more determine which plants are to survive.

It is then that the plant that has been making full use of mechanical handling equipment to boost war output will find that the same equipment is its sharpest-edged tool for cutting costs.

It is therefore with this double-barreled thought in mind—speed of output plus economy of manufacture—that we offer this Eighteenth Annual Special Section on Materials Handling. To all management—and especially to those men who are beginning to think of post-war problems—do we suggest careful study of good handling usage as it is exemplified in the pages that immediately follow.

Handling moves can be variously classified. We have elected in this section to break them down into *yard*, *process*, *assembly*, *storage*, *special*, and *shipping* jobs. Each "case" consists of a photograph and just enough description to start the reader to figuring out how better handling will help his plant get the speed of output it needs today—*plus* the economy of manufacture that will be of paramount importance tomorrow.

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Yard Moves

Every plant has a handling job to do. It begins in the yard. Look there first for chances to speed output and cut costs

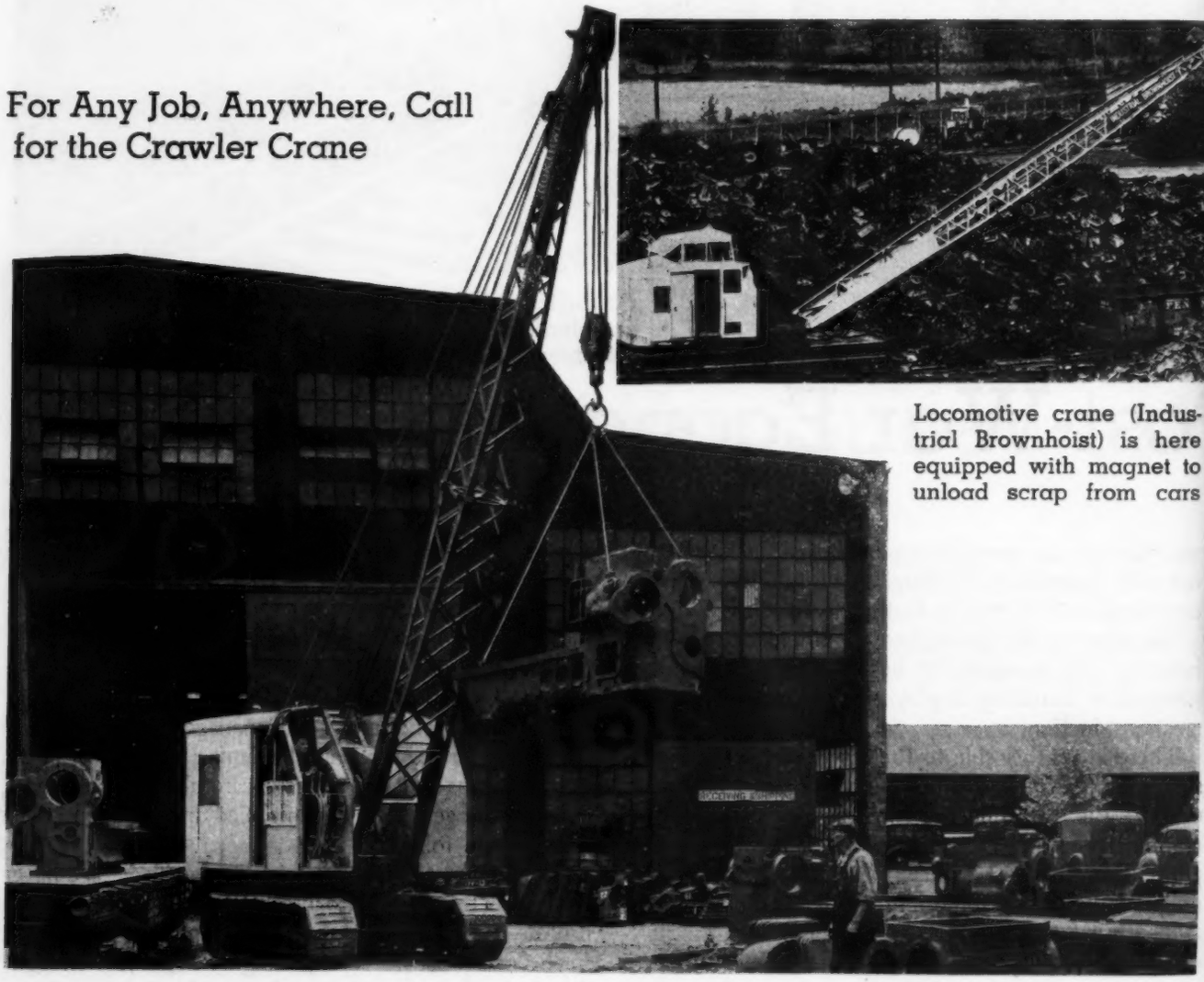
Saving Time From Car to Storage

FORK TRUCK AND TRACTOR (Mercury) team in removing lumber from freight cars and transporting it to storage.

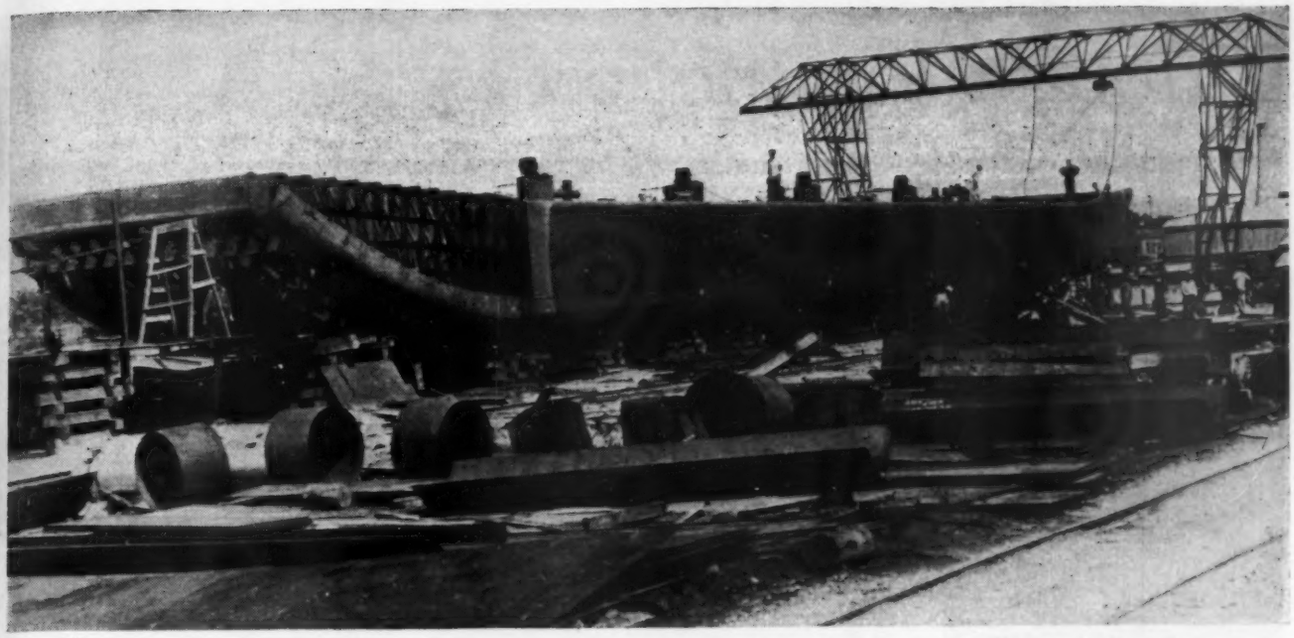
By arrangement with the supplier, the lumber is shipped on pallets. Handling operations are three in number. The fork truck (not shown) moves into the freight car, picks up a pallet load of lumber, then backs out and deposits the load on a waiting trailer. By the time a number of trailers have been loaded, the tractor has returned from a trip to storage and is ready to move off with another string.

For Any Job, Anywhere, Call for the Crawler Crane

Locomotive crane (Industrial Brownhoist) is here equipped with magnet to unload scrap from cars



Versatility and the ability to go virtually anywhere are outstanding characteristics that recommend widest possible use of crawler cranes. For example, a 10-ton crane (Northwest) takes on a hundred handling jobs, both inside the factory and out in the yard, at International Machine Tool Company, Indianapolis. Heavy castings are picked up in stride and speedily moved to yard storage



For a shipyard there's the traveling crane with long-lift air-motor hoist (Ingersoll-Rand)

Turns Skid Boxes to File Drawers

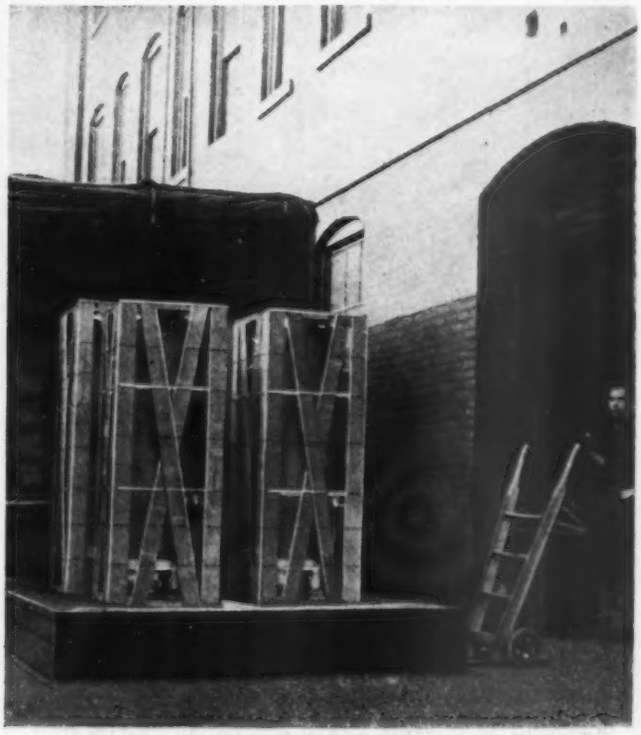
ONE SOLUTION to the storage problem—and a solution that conserves valuable production floor space—is to do the storing out in the factory yard.

In a manufacturing establishment that must go unnamed, a system of handling small parts in skid boxes was devised because each item had to be instantly available at all times. Each box is supported independently in the rack, and with a high-lift truck (Towmotor) can be moved into place or removed from the rack as easily as pulling out a drawer. As a result, the company has what might in all truthfulness be called a "parts filing system."

Man Loads Without Lifting

LOADING AND UNLOADING HEADACHES were cured in one plant by installing a hydraulic platform lift (Globe) in the driveway outside the shipping room door.

One man can now hand-truck crated units onto the platform, let the lift raise them to truck floor height, then "walk" them into the truck. No manual lifting. Less fatigue. Minimum chance of hurting workers or product. The movement of the load is always on the level. There is no need to call men away from other jobs to help out with the loading. The man who appears to be posing in the shipping room doorway is operating the controls.



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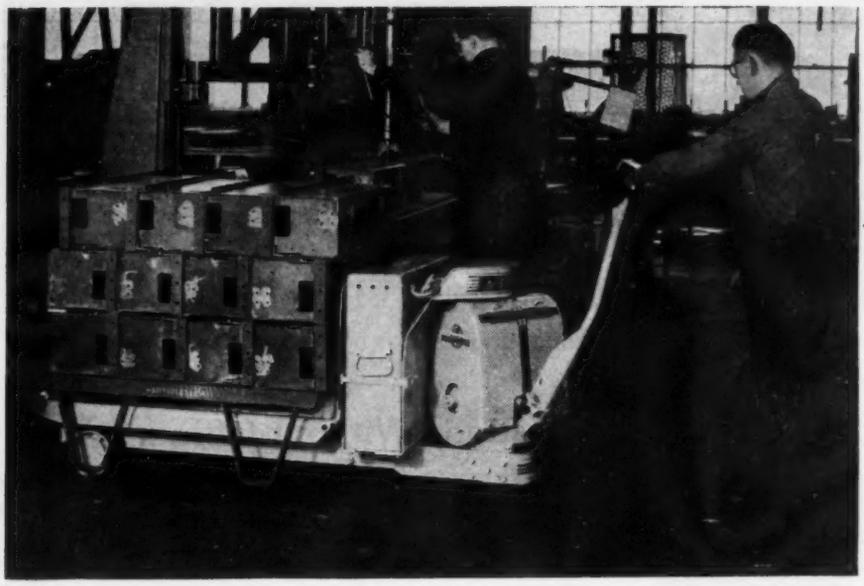
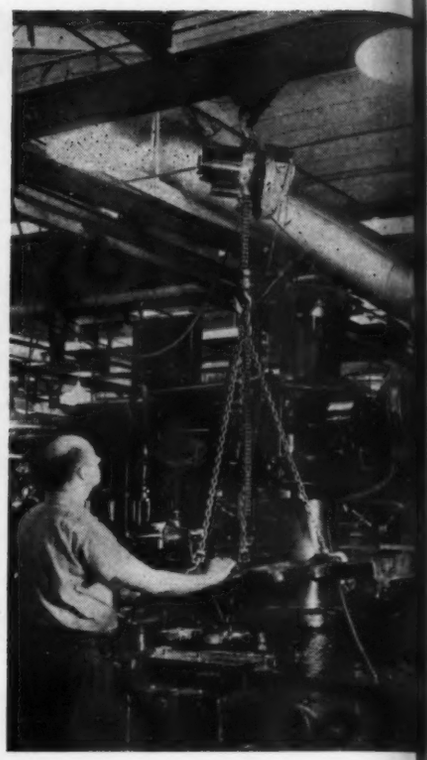
Through Production

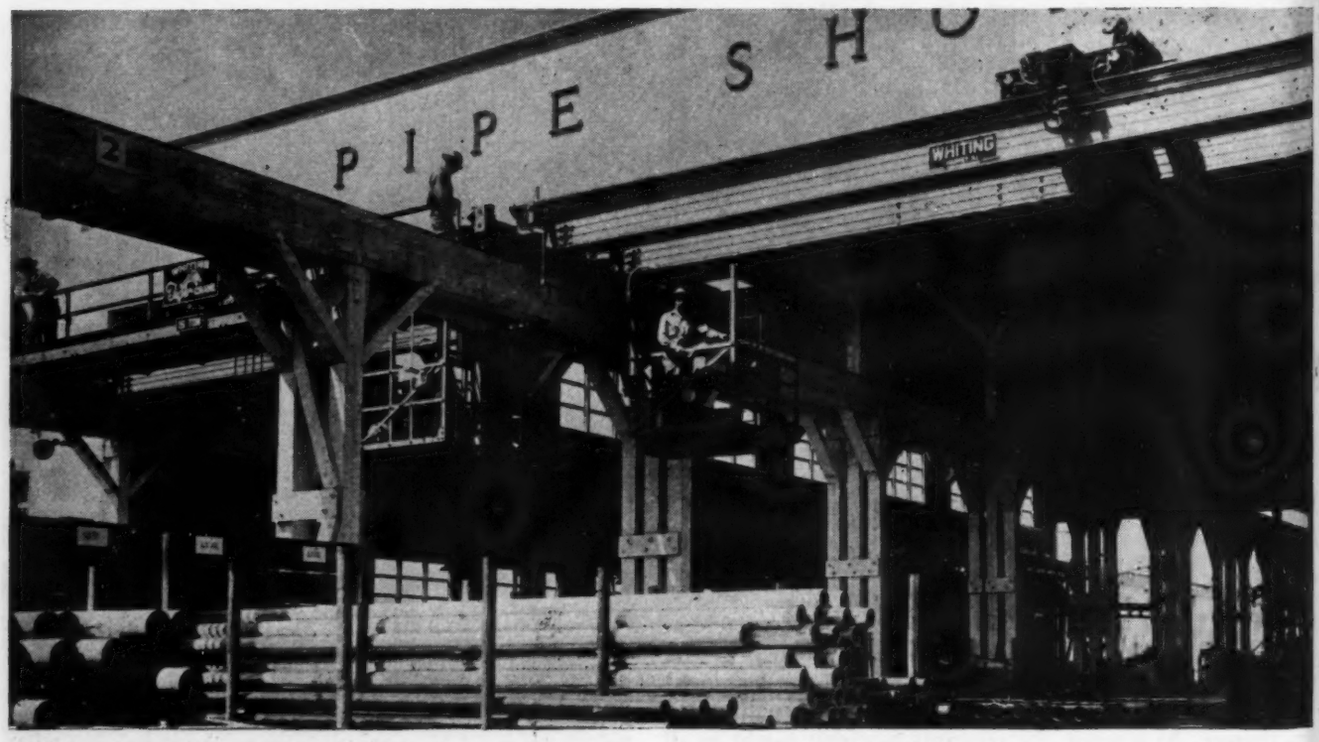
Production schedules are being met now—as they will also be met in post-war days—by teaming machines with the right kind of mechanical handling equipment



Coordinated methods for handling war production materials in a mid-western plant include transportation and spotting of unit loads of metal parts from one machine operation to another through the use of power-driven hand-lift trucks (Automatic) and skid platforms

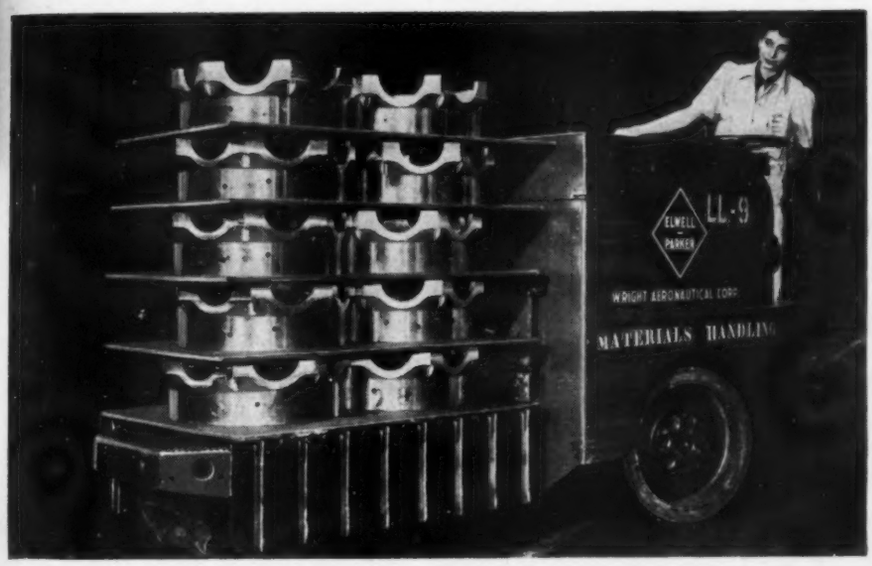


For handling heavy parts at machines, the electric hoist is always on the job. The hoist (Yale) in the photograph places parts easily in position, and, equally important in these days of accelerated production and disappearing manpower, shields the operator from fatigue



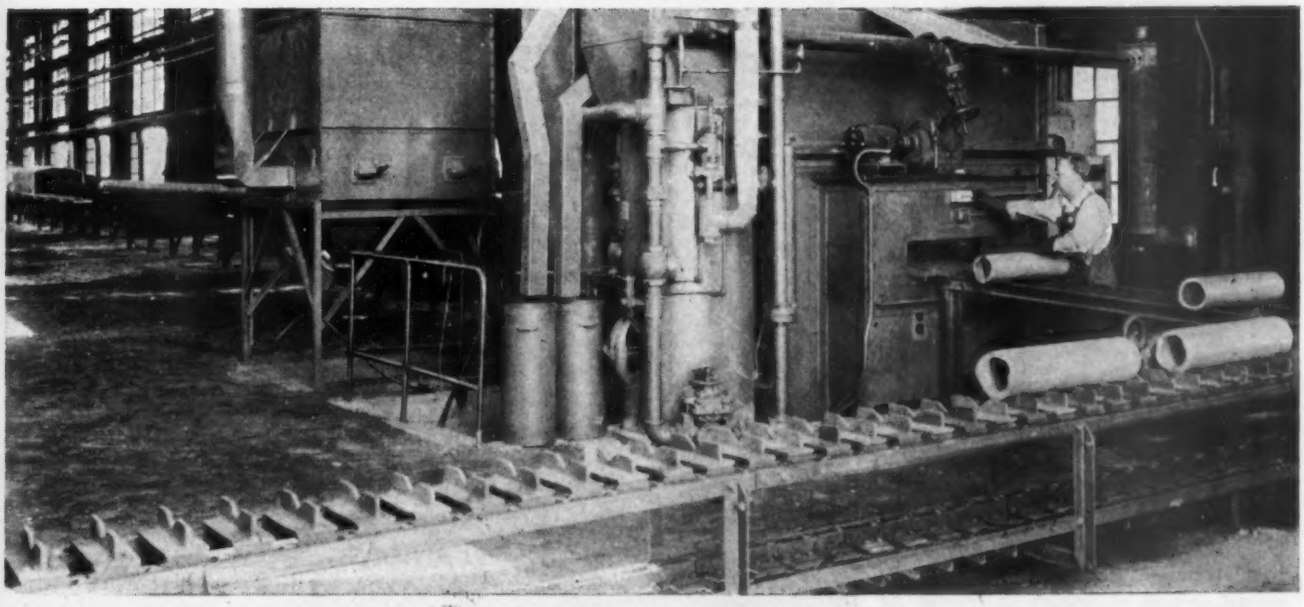
Electric traveling cranes (Whiting) do most of the handling in a West Coast shipyard. Of 5- and 10-ton capacity, they expedite movement of heavy materials through pipe, plate, welding shops

With roller conveyor and ball transfer (Mathews) a girl operator makes no bones about handling heavy die block through the Brinell test. Blocks are in two sizes, the larger weighing 2000 pounds



Assures Regular Flow of Engine Parts

To THE MANY factory fields that have been invaded by the fairer sex, add materials handling. Women are turning out to be first-rate truck drivers. At Wright Aeronautical Corporation, for example, Frances Cristelli snaps a 2000-lb. truckload of Cyclone engine parts down the aisle. Finger-tip controls move and steer the truck (Elwell-Parker), raise and lower its loads, make it easy for a woman to run.



In a shell-loading plant, conveyors maintain the steady flow of materials that is so vital to mass manufacture. Here hot forgings move and cool on a V-groove apron conveyor (Alvey-Ferguson)

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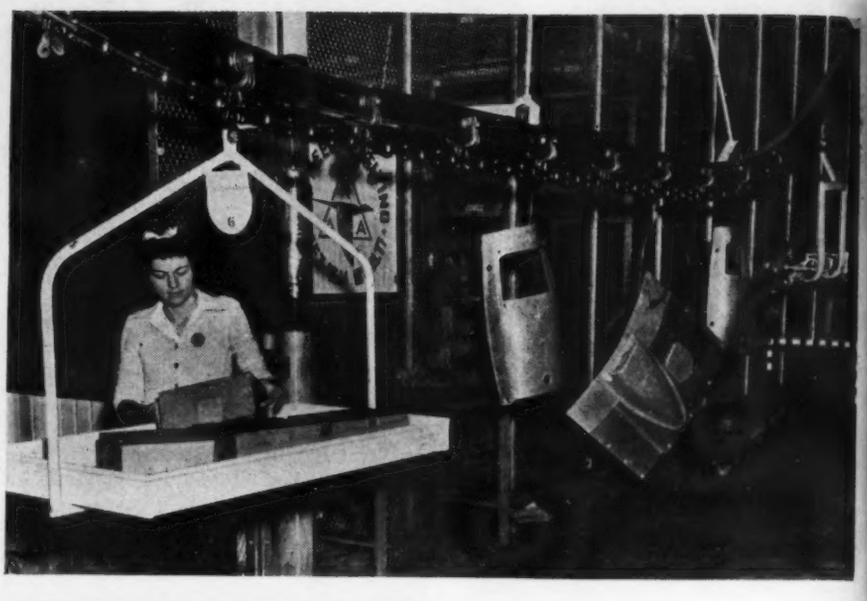
Insures Flow—and No Traffic Jam

AN OVERHEAD CONVEYOR line (Link-Belt) extends from equipment stores in the receiving department to the final assembly section at the Texas plant of North American Aviation, Inc. It is designed to eliminate unnecessary hand trucking and repeated handling of bulky material; to minimize floor congestion; and to take parts to the proper departments.

A girl in the receiving department is shown here placing boxes of parts on the carrier as the conveyor slowly passes her station. The sheet metal parts were placed on the line as it passed other stations.



Ball top pedestals (Logan) in the plate shop of a West Coast shipbuilder contribute materially to the speedy and efficient handling of ship plates. The ball tops permit movement of plates in any direction, and the pedestals allow the operators to move freely over the entire plate shop area

Speed is important, but safety is a vital consideration, especially when loads are big and heavy. Safe crane operation, without sacrificing handling speed, is assured when a sling is made of braided wire rope (Macwhyte) and properly rigged

Down Assembly Lines

Handling equipment paces production along assembly lines, makes it possible for workers to turn out the most work at the least expenditure of effort

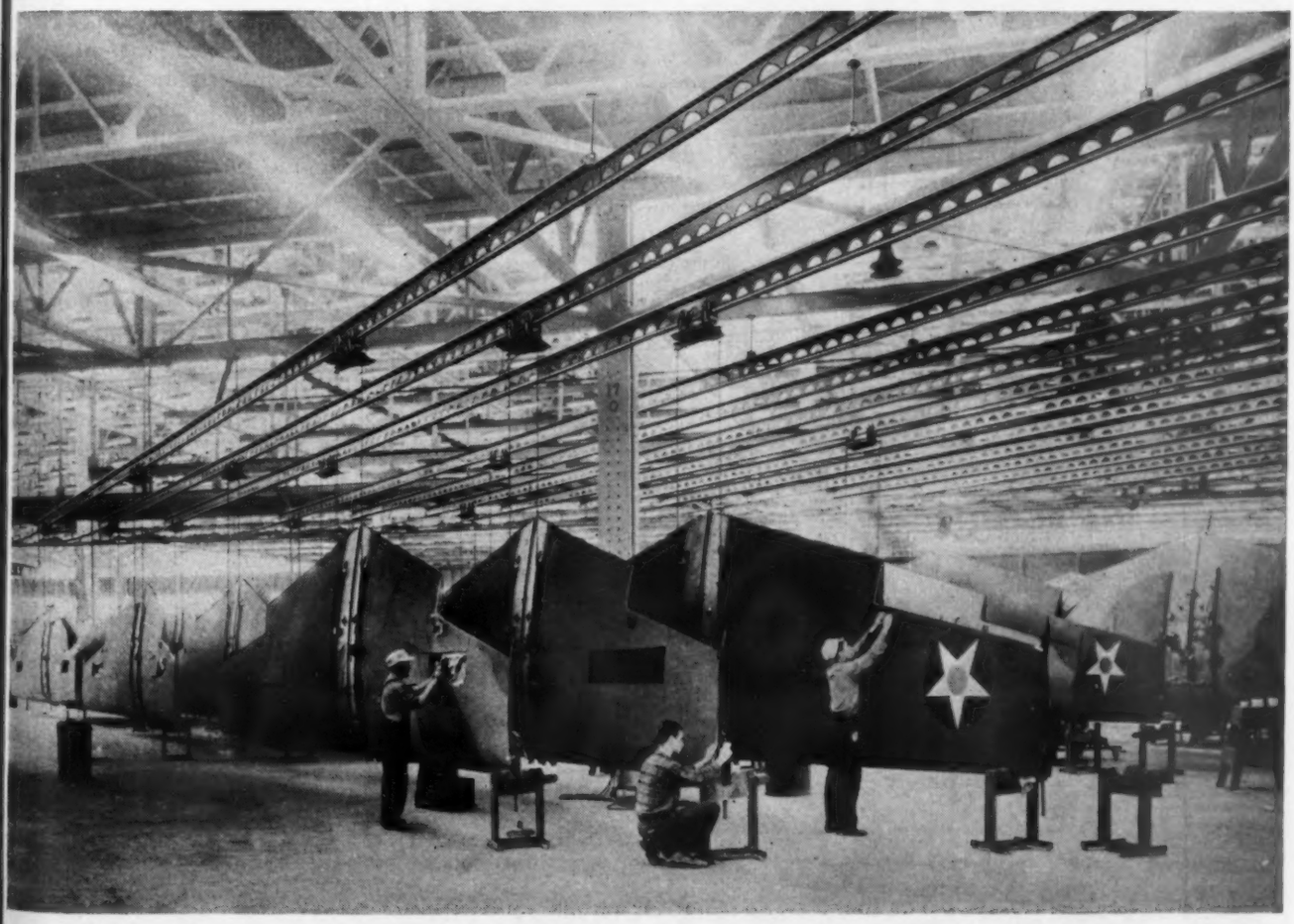
Shortening Final Assembly Time

(See photograph on section cover)

FINAL ASSEMBLY at the Nashville Division of Vultee Aircraft, Inc., is done with the work suspended in non-swaying adjustable hangers that travel along a mechanized overhead conveyor (Cleveland).

Conveyor lines at the plant are five in number—a final assembly line and four feeder assembly lines. The carriers on each of the lines have been specially designed for the work they have to transport. Where necessary, each of the subassemblies, as well as the final assembly, can be raised, lowered, tilted, or swung in an arc to suit the convenience of the operators.

Left, belt conveyor (Standard) conserves manpower in aircraft plant by helping skilled and semi-skilled workers produce more in less time. Conveyor travels length of plant between machine operators. As parts are finished, they are carried by the conveyor to the assembly line in another part of the building, or to storage



Wings for the P-40 are handled at Curtiss-Wright Corporation's Buffalo plant on an overhead rail system (Cleveland). Wings can be lowered to most convenient working height. No racks or supports are needed. Just small horses to keep the wings from swinging while they are being worked upon

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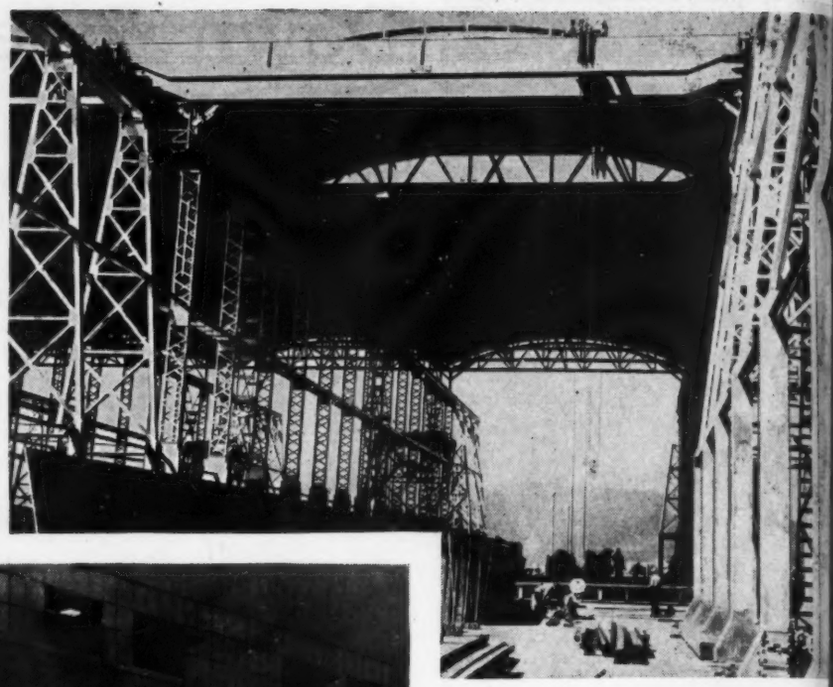
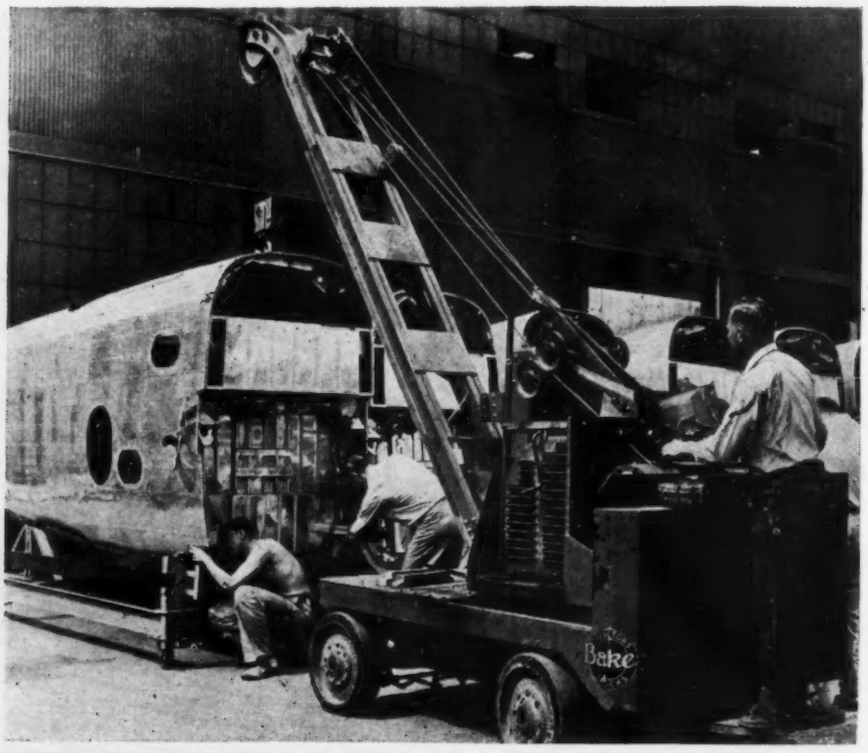
Speeds Ship Assembly

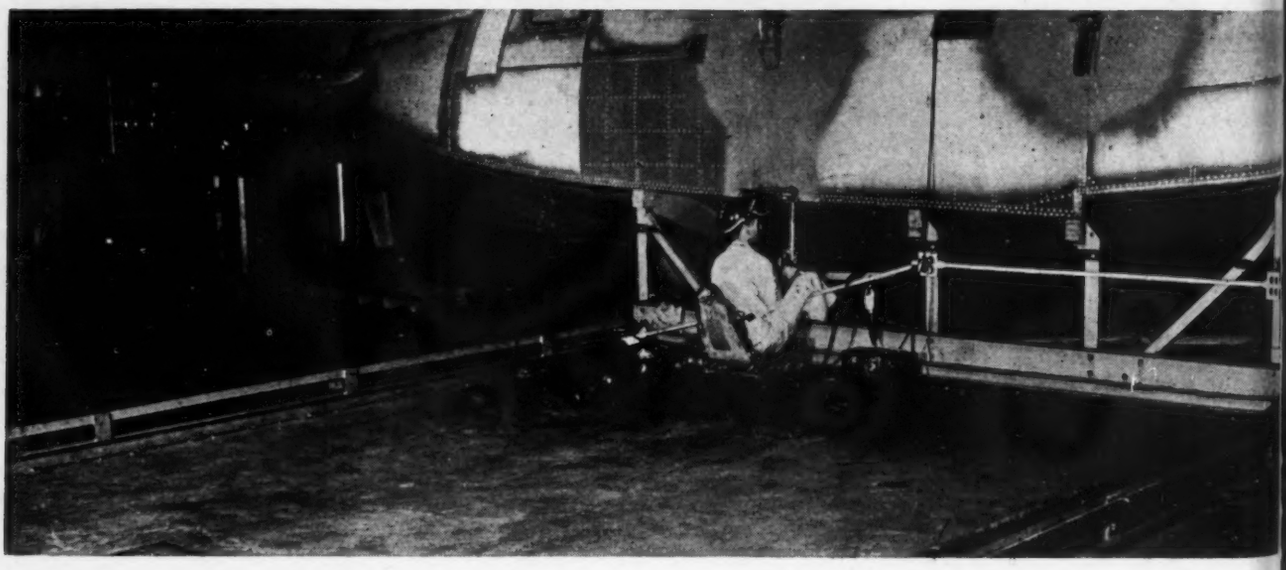
STARTING practically from scratch, America's shipbuilders are putting ships together at rates that exceed the most optimistic expectations of a year or so hence. Much of their success may be attributed to increasing use of mechanical handling equipment, which has enabled the shipyards to adopt many of the techniques of mass production. Pictured here is the assembly building in a West Coast yard where operations are expedited through the use of dependable crane equipment (Whiting).





Left, crane truck (Baker) speeds assembly operations on the North American B-25 and P-51. It moves fuselages into assembly position, helps install engines and propellers, and does general heavy duty around the plant

Below, forward end of PBY assembly line at Consolidated Aircraft Corporation's San Diego plant. Power-operated chain conveyor (Link-Belt) moves the assembly line ahead as required



Special Jobs

In every plant there are odd jobs that would be tough jobs without the right kind of mechanical handling equipment

Old man river—the Illinois—was fought to a standstill late in May with the help of a power lift truck (Mercury) which brought sandbags on skid platforms to keep back the destructive waters

One of many duties of portable factory lift (Globe) is to move dies from racks to presses; it raises die to right height so that it can be slid onto the bed of the machine. Other duties: To keep parts and materials at convenient work levels; to remove materials from core ovens; to lift and move materials of all kinds on skids; to stack cartons

Proves Aid to Good Housekeeping

SPECIAL DUMP TRUCK EQUIPMENT (Brooks) mounted on a standard chassis has earned its keep many times over at Malleable Iron Fittings Company, Branford, Conn. Shown below in the simple act of dumping a bucket of coal where it can be hoisted into the hopper behind the boilers, this versatile handler finds many uses. Good housekeeping, for instance, is a fetish with this company, which used to maintain a dump area in the middle of its foundry big enough to hold 15 to 20 tons of waste material, and had to tie up a crane for some little time each day in order to load the waste into trucks. The new way is to spot buckets—like the one in the photograph—at convenient locations. Once a day the truck collects and empties the buckets. Thus the crane is kept available for more productive work.

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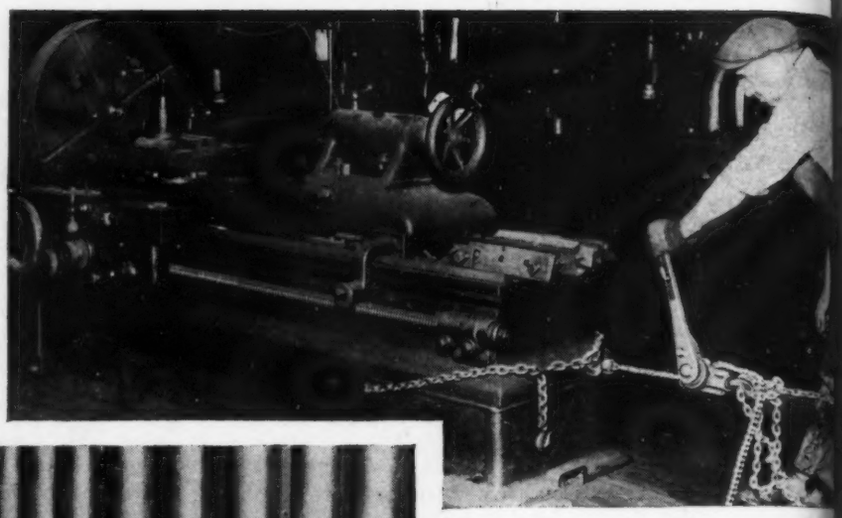
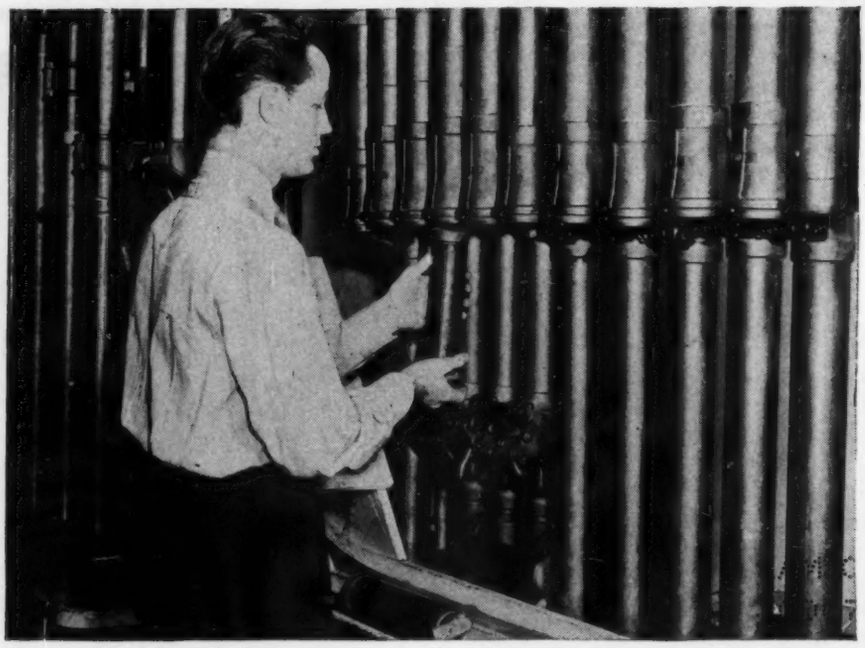
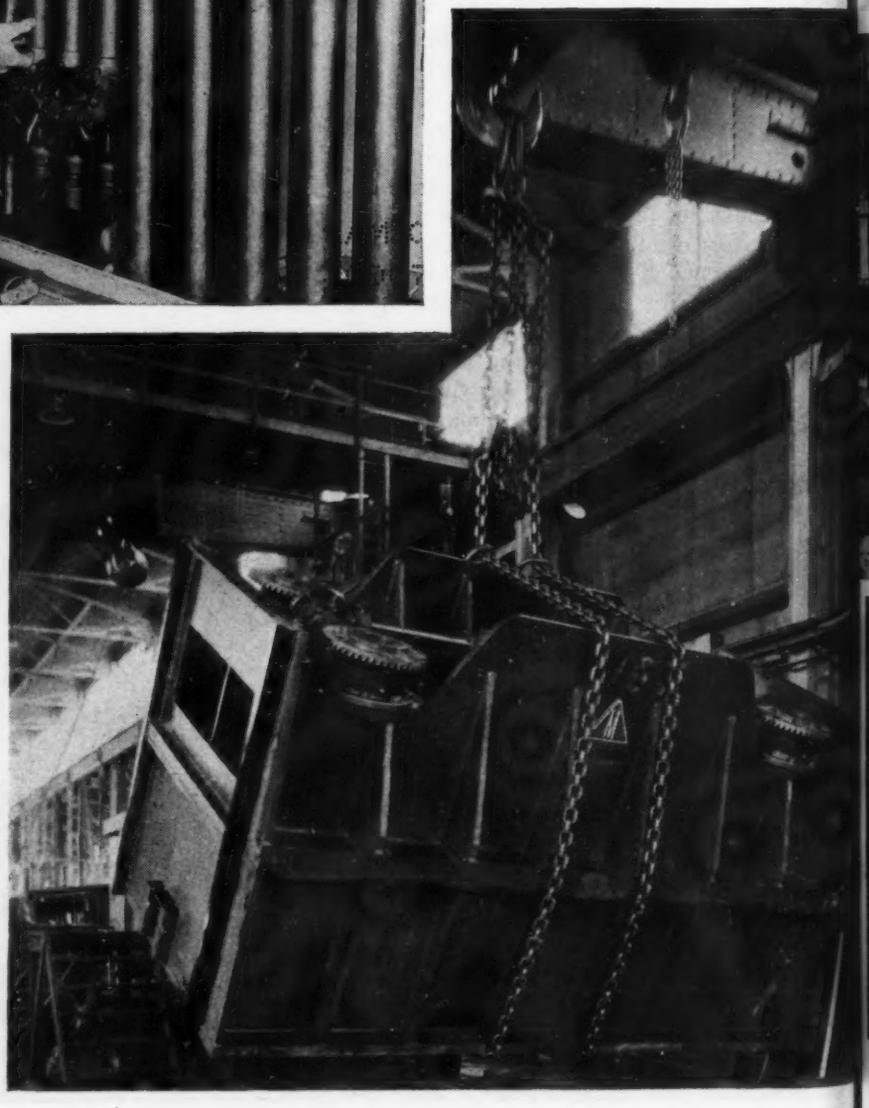


Alloy steel sling chain (Taylor) teams with big crane to handle a heavy piece of machinery with ease, safety, and dispatch. Machine shown weighs 39 tons



Special Delivery by Pneumatic Tube

CONTROL OF PRODUCTION involves the dispatching of orders, requisitions, drawings, and other paperwork with maximum speed. In the wide open spaces of the Douglas plant at Santa Monica, Calif., this special delivery job has been taken over by a pneumatic dispatch tube system (Lamson). There are more than 30 lines. One of the central stations is pictured.



When plants were converted to war production, layouts had to be changed, machines moved. Similar problems will be met when industry reconverts to the manufacture of peacetime goods. At such times the safety-pull hoist (Coffing) does a neat job of skidding machines into place

To and From Storage

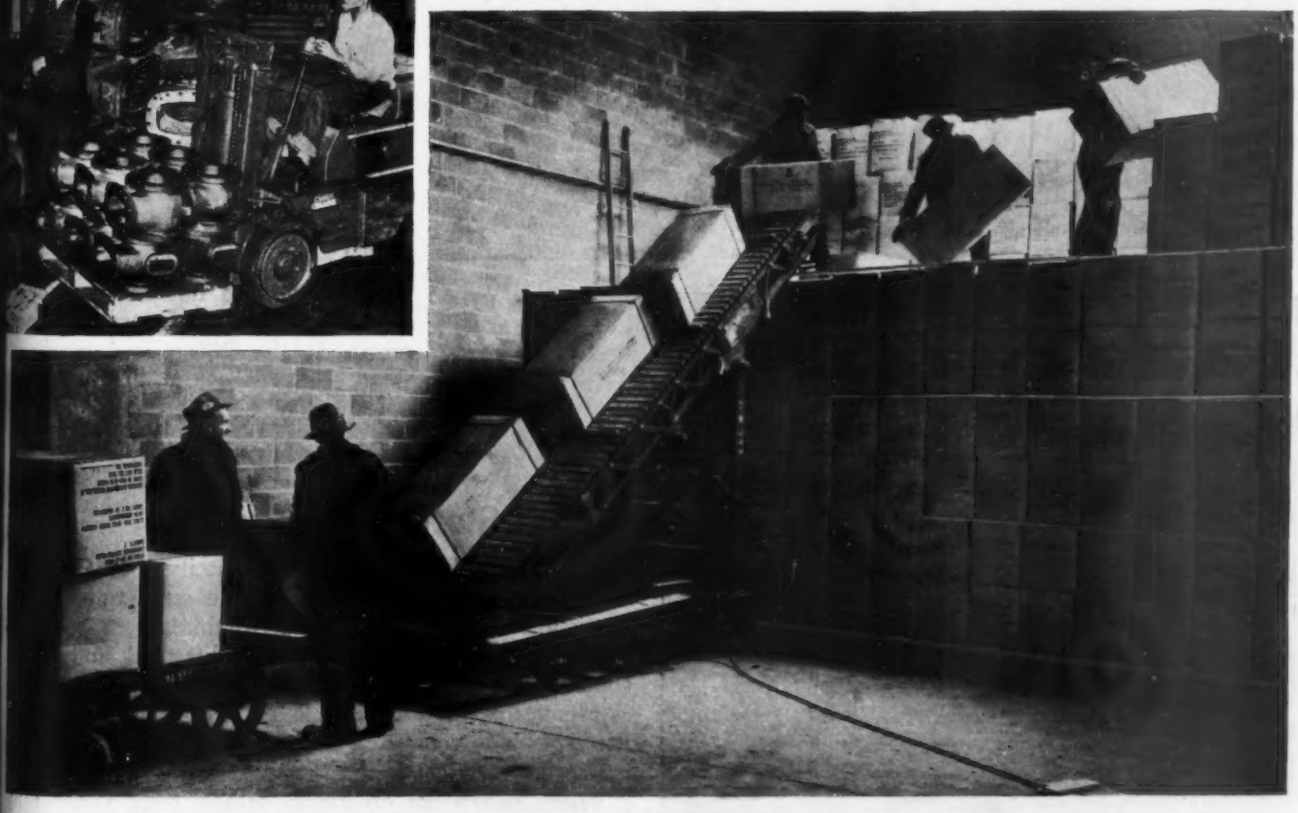
Better handling in warehousing areas means faster service to production departments

By Tractor-Trailer Train to Stores

TRUCKS AND TRACTORS in conjunction with conveyors provide something approaching the ultimate in handling systems for the Chicago warehouse of Sherwin-Williams Company. The warehouse occupies a space 288 by 624 feet, has accommodations for eight railway cars and twenty highway trucks within the building. Packages comprise 50- and 30-gal. drums, 5-gal. pails, and a wide variety of smaller units in cartons. Smaller units arrive from production at rates up to 60 per minute.

Tractor (Baker) in photograph at left is hauling a multi-trailer train from conveyor to storage.

Valves for Uncle Sam's fighting and cargo ships flow in an unending stream off production lines at Jenkins Bros., Bridgeport, Conn. Here a power truck (Clark) picks up a pallet load of valves ready to go either to storage or direct to the shipping room



Portable stacker (Jeffrey) assures full utilization of warehousing area

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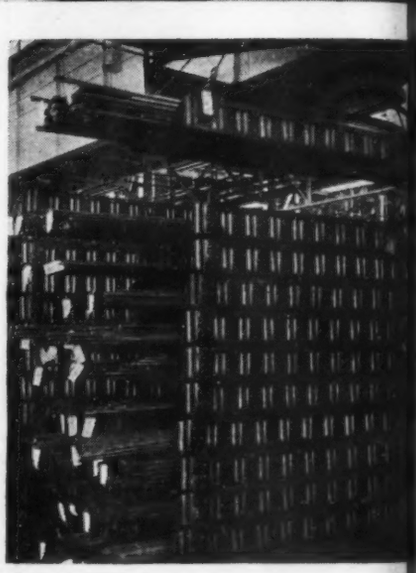
Fork Trucks Increase Output

PALLETS AND FORK TRUCK (Automatic) have simplified movement and storage of vital materials in a large war plant. The inevitable result is increased production.

Unit loads of parts are moved from incoming transportation systems to storage areas just outside of the assembly building or directly inside. As material is required for production, trucks supply flexible transportation.

Other jobs performed by fork truck include handling and stacking of skid loads of forgings to and from annealing ovens, movement of forging blanks from yard crane magnet to electric furnaces, removal of scrap in special hoppers designed for fork truck operation.

Below, reversible utility conveyor (Lamson) handles package loads with greatest of ease, makes it possible to store to ceiling level, thereby solving one plant's storage problem. Shown in extreme inclined position, it is fed from a gravity roller conveyor



Problem at a midwestern plant was to store bars economically. Answer was to tier in open-end metal boxes (Union), let traveling crane do the lifting and moving

Triples Storage Capacity

HIGH STACKING has tripled storage capacity at R. C. Remmey Company, Philadelphia. At the same time, labor requirements have been reduced two-thirds.

Method used is the highly favored lift truck and pallet combination. Photograph shows the truck (Towmotor) in the act of depositing a pallet load of firebrick up near the roof. The company has found it possible to arrange wedge-shaped bricks to form regular, stable loads.

Pallets shown are 46 inches square, carry about 600 bricks. The load weighs approximately 3500 pounds.

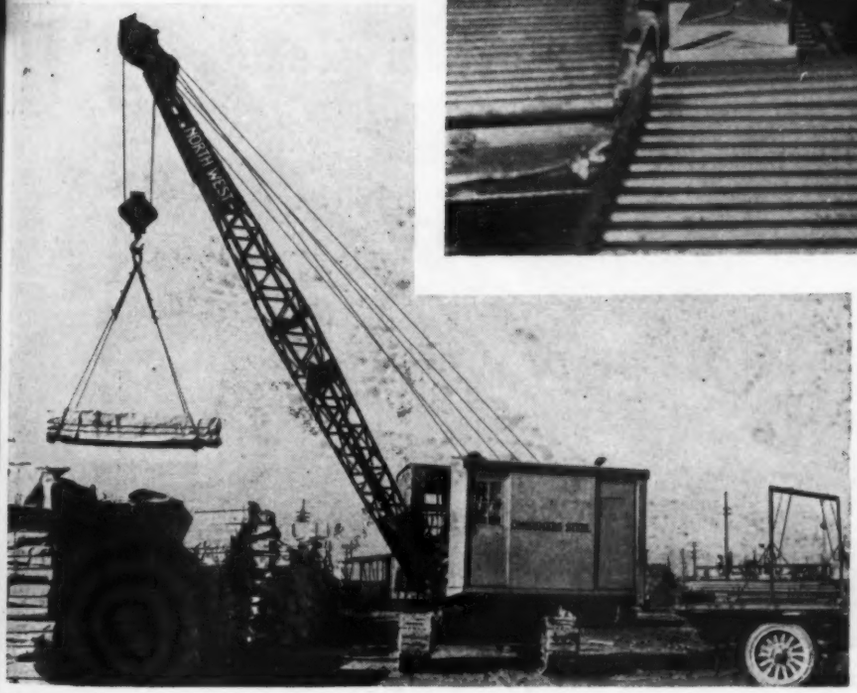
Shipping

Better handling prevents possibility of slowdown at the shipping room door

Packed and Shipped by Conveyor

CONVEYORS expedite packing and shipping operations in a Southern warehouse. They are part of an extensive system (Logan) used in storing and reconditioning telephone sets and auxiliary equipment. The reconditioned equipment is delivered by roller spiral from the second floor; is checked, packed, and weighed on the four spur lines, then routed to shipment via the line in foreground.

Right, part of large conveyor system (Standard) at the Carr Lowrey Glass Company plant in Baltimore. The roller spiral lowers shipments of glass to a live roller conveyor on the first floor, thence to shipping docks. No handling is needed from the time packages enter the spiral until they are delivered in the warehouse



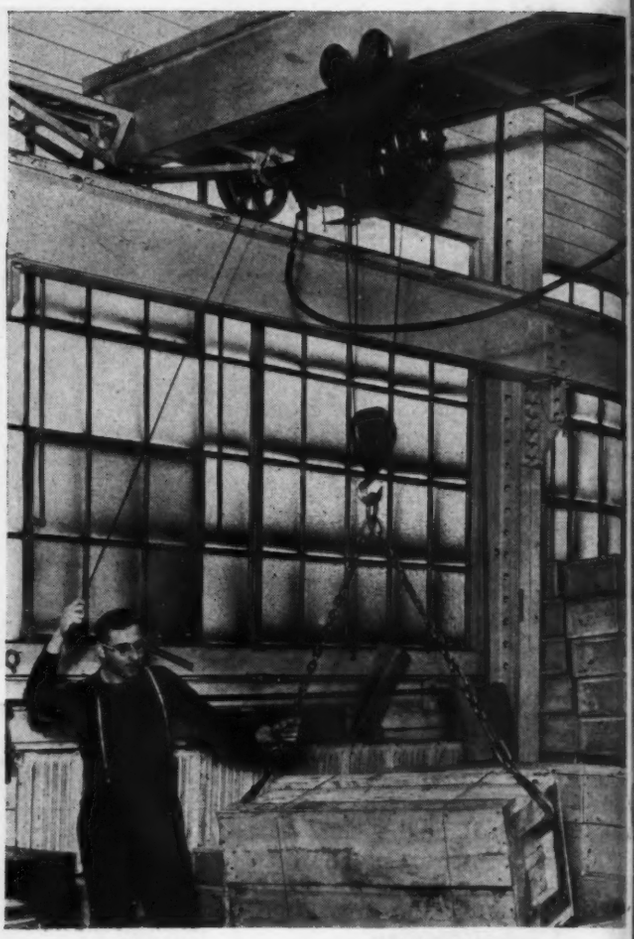
Left, a typical yard operation with crawler crane (Northwest). Finished sheets at Consumers Steel Corporation, Detroit, are being taken from stockpile to waiting motor truck

CONTINUED ON NEXT PAGE

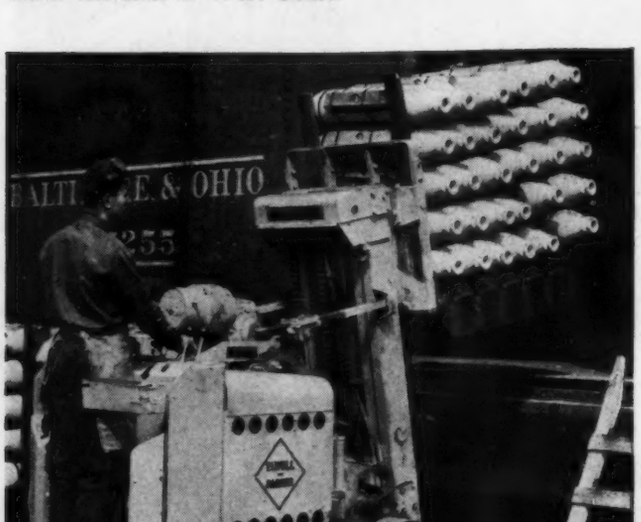
Speeds Shipping of Gas Bombs

SHOULD THE Axis descend to gas warfare, it will find America and her Allies ready to retaliate on the grand scale. Production of gas bombs in quantity has been started by Enamel Products Company, first in the Cleveland Ordnance District to undertake such a contract.

It is mechanization, of course, that will enable this concern to keep its delivery promises, and industrial trucks are playing an important role. In the photograph below, a truck (Elwell-Parker) has carried a skid load of 30 bombs from testing floor to railway siding, and, in one continuous operation, is loading the bombs into a boxcar headed for either the East or West Coast.



Above, an air hoist (Ingersoll-Rand) does all the lifting, conserves shipping-room manpower



Portable belt conveyors (Jeffrey) accelerate handling, storage, loading of supplies for armed forces

Performance Determines Direct Labor Costs

ROBERT C. BERMAN, Industrial Engineer, Colonial Provision Company, Boston

THERE SEEMS TO BE LITTLE SENSE in assuming that the cost of direct labor is a constant. If the workers slow up, costs rise; if they speed, costs fall. If a product is produced during overtime, or if a menial job is done by a highly rated man, costs climb to the roof! No unchanging figure in dollars/unit can be accepted as "the cost of labor on this product," when the greatest fluctuation of all cost elements lies here.

This is the story of how we make our selling prices reflect performance of employee and employer.

It is probably the cry of every small manufacturer that, although the proposed system is good, the clerical cost of operating the system is too great. Our first thought, therefore, when making a suggestion along the lines of more scientific management, is "How easily and inexpensively can this idea be installed and operated?"

It was only natural, then, when asked to work out a system for finding direct labor costs, for us to examine what records were already being kept. Perhaps we could derive some plan whose primary clerical work was already being done for some other purpose. And after going through the ledgers, we did find exactly this—a successfully operating production and labor control system, whose results we could easily convert into dollars per hundredweight for each product.

Actually, therefore, to explain this unique plan of cost derivation, and to indicate our using other records as a base, we shall first have to describe the "other records."

Because of the nature of our product and its manufacture, workers in this plant are grouped in crews of from four to thirty men, each gang or department being under the supervision of a single foreman. All workers are paid by the hour, regardless of output, though these base rates vary individually according to skill and length of service.

In our record keeping, each of these departments is considered as a single producing unit. By that I mean, production reports include only those pieces that have passed completely through all operations in the group and are ready to travel on to other gangs elsewhere in the plant.

Through careful methods analysis and time study, "standards" have been set up for each product thus "finished" in each department. A standard allows time for all operations on the item which a department must do, plus allowing for fatigue, unavoidable delays, and personal needs, and being leveled to the performance of an average man under average conditions.

Hence, 100 percent of the standard would represent average performance. To fit our operating conditions, all standards are expressed in production per man-hour.

Simple Calculation

If we know a department's production on each item it handles, it is a simple matter for us to find how much time that output *should have taken*. If, for instance, a gang produces 200 pieces, and the standard is 10 pieces per man-hour, that work should have taken 20 man-hours. These are called "standard hours," and can be found from the equation

$$\frac{\text{Production}}{\text{The Standard}} = \text{Standard Hours}$$

To find out whether this is good or bad performance in regard to speed of work, we have only to compare the "standard hours" with the *actual* man-hours worked by the gang on this product. If our crew consists of five men, and they each worked five hours on the job, then the actual man hours consumed are 25; and the ratio of 20 to 25 shows us a performance only 80 percent of standard.

On our records, performance is expressed in percent and is called "hourly proficiency" (hereafter referred to as H.P.). It is found by the equation

$$\frac{\text{Standard Hours (Time Allowed)}}{\text{Actual Hours (Time Taken)}} = \text{H.P. (Time Performance)}$$

When work is done for which no standard has been set, we can only assume that this non-standard work was done at an average performance (H.P. = 100 percent). Thus, we allow as many "standard hours" for daywork as there were actual hours spent on it, so that their ratio will give an hourly proficiency of 100.

In the preceding paragraphs, I have explained the methods for getting performance figures. In practice, a control sheet has been printed for each department. All products handled by the group are listed down the side, with their respective standards, while columns for each day include spaces for production, standard and actual hours, and H.P. (see Figure 1). Spaces for weekly totals and computations, on the end of the sheet (Figure 2), will be discussed later.

At the end of the day every foreman makes out a report of his department's output on each product, and also the man-hours his gang actually worked on each. If a worker has been transferred to another group for part of the day, a transfer slip records his working number, time involved, and sending and receiving departments.

With these reports (production, hours, and transfers), it is a simple matter for the clerk to obtain an H.P. for each product. In addition, he gets daily totals for the whole group on all products. (Figure 1 shows how the previous examples would be entered.) Here at Colonial, where we have 15 departments totaling about 300 workers, one control clerk easily gets the daily performance figures ready by 10 the following morning, in time to reach the watchful eyes of the foremen and the plant superintendent.

So far, the question of monetary gain or loss hasn't entered the picture. Naturally, if a gang "beats" the standard, we want to know how much saving that represents; if it drops below standard, what is the loss in dollars and cents? If the crew worked any overtime, we should still "lose" money even if the H.P. showed 100 percent performance!

The calculations that reveal these monetary effects are only done by the total week, which is our pay period.

Having set standards that tell how much production we should expect per man-hour, and knowing the hourly rate at which such work is done (average base rate of the crew), we can

easily find what our cost per piece *should* be on each product. This is called a "standard unit cost," and is found in the equation.

$$\frac{\text{Average Crew Rate (Dollars/Hour)}}{\text{The Standard (Units/Hour)}} = \text{Standard Unit Cost (\$/unit)}$$

In the illustrated case, if the crew's average rate is 50 cents per hour, the item whose standard is 10 pieces per man-hour will cost 5 cents per piece.

These "standard unit costs" represent what the labor cost will be if the crew "hits" the standard, doing 100 percent performance. (Under a piecework wage system, these standard unit costs would be the piece rates.) Like the production standards, they are printed right on each sheet for every product (Figure 2). It would be well for the reader to remember clearly just what these "standard unit costs" consist of, because it is upon them that we base our labor cost derivation.

Just as our control clerk finds "standard hours" (the time that should have been taken), so with the standard unit costs can he obtain a "standard payroll" (the wages that should have been spent). In this case, the total weekly production on an item is added across and entered beside that item's standard unit cost. The "standard payroll" is then derived:

Production × Standard Unit Cost = Standard Payroll

Figure 2 illustrates this procedure. If 1000 pieces were produced during the week, and the standard unit cost is 5 cents per piece, then the "standard payroll" is 1000 × 0.05 or $50 (the wages that *should* be paid for an output of 1000 pieces).

A "standard payroll" amount is found for each product in the department, and the total becomes a weekly "total standard payroll."

Naturally, to find our profit or loss, this total *standard* payroll must be compared with the *actual* payroll.

From the payroll division of the office staff, our control clerk obtains the *actual* weekly payroll of the group. This is a tabulated figure, and takes into consideration the exchange of labor dollars caused by transfers of men into and out of the gang. (If the reader will recall, the clerk gets daily reports of these transfers from the foremen. He prepares their analysis for the tab department weekly.) Thus the actual departmental payroll discussed here only includes *wages paid for hours charged* to this department on the sheet.

Just as the ratio of standard to actual hours gave us an hourly proficiency (time performance), so the ratio of standard to actual payrolls gives us a "money proficiency" (money performance, hereafter called M.P.). The H.P. shows whether the gang did the work in the *time* allowed for it; the M.P. shows whether the gang did the work within the *expense* allowed for it.

NO.	OPERATION	STD. PROD. PER MAN-HOUR	THURSDAY				FRIDAY			
			Man-Hours		Act. Prod.	% Prof.	Man-Hours		Act. Prod.	% Prof.
			Std.	Act.			Std.	Act.		
1	(Name of Product)	10	20.0	25.0	200	80				
2	(Name of Product)	72								
3	(Name of Product)	15								
4	(Name of Product)	80								
	DEPT. TOTAL		100.5	106.5	4060	94				

Figure 1. Products are listed, with their standards. Columns for each day include production, standard and actual hours, and proficiency

Under ordinary conditions and with straight-time work, the H.P. and M.P. will be equal. It stands to reason, therefore, that a substandard performance will lose money, and an above-standard performance will gain.

However, if there was any overtime work, or if the foreman used a higher grade of labor on any job than he should have, the money proficiency will be lower than the hourly. Under such conditions, it often happens that a crew doing its work within the allowed time (H.P. = 100 percent) still shows a monetary loss, because that time cost the company more money than was allowed for it.

It is obvious that any such difference in the two proficiencies is a *reflection on management*, since at straight-time pay and with no misuse of graded labor, the two figures should be equal. In the illustrated example (Figure 2) we can see that the crew performed at 100 percent of the standard, but some managerial factor caused their actual payroll to be $5.60 too much, giving them an M.P. of 98 percent.

In reviewing the production and labor control system, we can see that our results show two aspects of performance: Time and money. In terms and procedure, they closely parallel each other (see table below).

We come now to the problem, as originally stated, of making this whole production and labor control system a tool for direct labor cost derivation. Actually, the only base we take from the records is the standard unit cost, and the other figures (proficiencies, etc.) are made into factors by which we convert the standard to an actual cost. All cost data are taken from the weekly results.

It should be apparent to the reader, after the preceding paragraphs, that our standard unit cost *would be the actual* if the gang worked at standard performance, with no overtime, and using only the grade of labor for which it was allowed.

However, such cases are rare. Almost always we have to multiply the standard cost by one or more factors, to show the higher cost of poor performance, or the lower cost of good

Performance in Time and Money

Time	Money
$\frac{\text{Production}}{\text{Standard}} = \text{Standard Hours}$	$\text{Production} \times \text{Std. Unit Cost} = \text{Standard Payroll}$
$\frac{\text{Standard Hrs.}}{\text{Actual Hrs.}} = \text{H.P.}$	$\frac{\text{Standard Payroll}}{\text{Actual Payroll}} = \text{M.P.}$

$$\frac{\text{M.P.}}{\text{H.P.}} = \text{Performance of Management}$$

TOTAL FOR WEEK									
Std. Hours Prod.	Act. Hours Wkd.	Hourly Prof.	Actual Weekly Prod.	Std. Unit Cost	Act. Unit Cost	Std. Pay-roll	Act. Pay-roll	Difference Black — Gain Red — Loss	Money Profit
110.5	120.2	92	1000	.05000		$50.00			
			18100	.00695		125.90			
			1000	.03333		33.33			
				.00625					
550.0	547.5	100	25050	$.0110	$.0112	$275.40	$281.00	$5.60	98

Figure 2. Standard unit costs for the week are printed for each product. The ringed "difference" above is red in the original form

performance. The following paragraphs will explain our methods and reasoning in getting the *right* factors:

If a crew's performance is high, the cost of that crew's products will be correspondingly low; while, conversely, the lower the performance falls, the higher the costs climb. It will be noticed that this is an inverse, not a straight, relation between costs and performance.

Since our hourly proficiency is the figure that indicates the gang's performance, it is only natural that we use this H. P. to form our first factor. We obviously can't use the H.P. directly as a factor, for then we should *lower* the cost for low performance (which we know is wrong). We must keep the inverse quality. This is easily done by using the *reciprocal* of the H.P. percent.

Let us continue to use the example afforded by product No. 1 in Figure 2. Standard hours produced for the week were 110.5 and actual hours worked were 120.2, giving an hourly proficiency of $110.5 \div 120.2 = 92$ percent.

This 92 percent represents, of course, performance *lower* than standard, and will therefore raise the actual above the standard cost of 5 cents per piece. The factor which will correctly do this is $\frac{1}{0.92}$ (the reciprocal) or 1.087.

It is easy to see that work done during overtime, or by more expensive labor than is allowed for, will cost more than straight-time work by properly rated employees. Such mismanagement is shown up by a difference between hourly and money proficiencies, as explained above. For example, although the crew in Figure 2 had a total departmental H.P. of 100 for the week, mismanagement pulled the M.P. down to 98, a drop indicated by the ratio

$$\frac{0.98}{1.00} \text{ or } 0.98.$$

As in the subject of performance, we again have an inverse relation between this ratio and the actual cost: The higher the ratio, the lower the cost, and vice versa. Using the same method to preserve this inversion, we obtain our factor from the *reciprocal* of the ratio, in this case

$$\frac{1}{0.98} \text{ or } 1.020.$$

Hence, if the standard unit cost were multiplied by the two factors described above, we should have an *actual* unit cost correctly allowing for variations in the performance of both employee and employer.

At this point in our computations, we introduce another element of expense which, in all cost convention, should not be included here at all. I

PRODUCT_____ DATE_____

DEPARTMENT	Basis of Cost	Stand. Cost	FACTOR				Yield to Finish	Total Factor	Cost Per Unit	Conv. Fact.	Actual Cost Per Unit
ARTERY PUMPING	100 Pcs. Pumped	.050	1.087	1.020	1.222		1.1	1.49	.0745	0.1	.0075
			F 12	F 20	F 21	F					
CURING CELLAR	100 Pcs. Cured		F	F	F	F					
ELEVATORS											
MECHANICAL											
WASHERS, JANITORS, AND WATCHMEN											
									TOTAL LABOR COST PER CWT.		

Figure 3. To coordinate all information into a concise report, each cost has to be converted into dollars per common unit, so that a total direct labor cost for all departments can be obtained

refer to daywork on non-standard jobs. But here at Colonial, we prefer to distribute the cost of daywork among the standardized products, instead of keeping it as a separate element.

Since all daywork is considered performed at average, or 100 percent, speed, we must also accept the crew average base rate as the standard cost for an hour of daywork labor. The weekly total of such work is, of course, expressed in hours, and when these are multiplied by the standard cost per hour, we get a "standard payroll" for daywork.

If, for example, our crew worked 100 daywork hours, the "standard payroll" for such would be 100 × 0.50 (average base rate) or $50.

To apportion this expense evenly among the standardized items, we have only to raise each item's cost enough so that the total sum of these additions equals the wages charged to daywork. The percent by which each cost will be raised is found in the ratio:

$$\frac{\text{Standard Payroll for Day Work}}{\text{Total Standard Payroll for All Other Work}}$$

In the above case, for example, $50 out of the total $275.40 standard payroll is charged to daywork. That means that every other cost will be raised by

$$\frac{\$50}{275.40 - 50} = \frac{\$50}{225.40} = 22.2 \text{ percent.}$$

A third factor, therefore, is thus formed, to apportion daywork charges evenly among regular items.

From this point onward it is merely a matter of coordinating our information into a concise report. This is not too easy a job, because different departments use different cost bases. Each cost has to be converted into dollars *per common unit*, so that a total direct labor cost for all departments can be obtained. Here at Colonial, where we sell by weight, we find each item's cost per hundredweight.

In Figure 3 we illustrate how the previous examples would be entered as a report. The name of the product and its weight (here, 10 pounds) head the page. Then is entered the standard unit cost (our base for calculation), followed by 1.087 (the performance factor), 1.020 (management), and 1.222 (daywork apportionment). The "yield to finish" of 1.1 allows for the amount the product will shrink in its travel from that department through to final shipment; this factor makes all costs refer to the weight by which the item is sold.

Hence, 1.087 × 1.020 × 1.222 × 1.1 = a total factor of 1.49, which multiplied by the standard cost of 0.050 gives an actual departmental cost per unit = 0.0745. Since the cost base is 100 pieces in this case, and each piece weighs 10 pounds, our 0.0745 is a cost per 1000 pounds, and must be converted to hundredweight by a factor of 0.1.

This procedure is followed for each department that has been standardized. There are, however, certain departments that have not as yet been put on standards. Cost per hundredweight in these can be found only by dividing the actual payroll of the department (obtained from the payroll staff) by the sold weight of that product during the same period When these non-standard departmental costs are added to those of the standardized departments, we have a complete labor cost per hundredweight for every product.

The illustrations and examples given here would imply that a new cost report is submitted every week. However, this is not the actual case, and has only been done here to clarify the text. Since prices cannot too often be changed to keep up with variations, drops, or emergencies in labor, and since it is wiser to look at labor costs with a broader and more cumulative view, we determined a set period over which labor costs would be revised (in Colonial, quarter-annually). Thus, the weekly standard and actual hours, total and daywork standard payrolls, and hourly and money proficiencies (all in Figure 2) are entered in a separate book, and only accumulated when a new cost report is due.

Personnel Helps for Foremen

3. THE OLD TIMER

THERE WAS A PICTURE called "Dumbo." It was about an elephant with ears so big they were funny. Those big ears even got in his way when he tried to run, and slowed him up. Everybody in the circus made fun of him—and he grieved.

But Dumbo had a friend. One day this friend gave him a feather, and put him up in a tree, and said, "You can fly." Dumbo believed him. He spread his big ears and he flew. Everybody cheered. He became one of the stars of the circus. The things that kept him down, sent him up!

The old timer—here's what to remember about him. He's got big ears too. They're made of pride, experience, and skill.

But his skill is hampered by fear that his methods are out of date. His experience is slowed down—because he's not as young as he used to be. And his pride and joy in his job are dimmed by the thought that this wonderful, unlooked-for chance to be of use once more will be lost because he's too old.

So he's crochety sometimes. Yep—often he's slow. But that old timer cares more about his job than any younger man in the place. To the others, the job is bread and butter—or maybe a chance to be patriotic. It's more than that to the old timer. It's the difference between life and death. Because — remember this, brother: When a man feels his usefulness is over, he doesn't care much about living. And generally he doesn't last long.

TWO RULES

Forgive him his age—and use what he knows.

Fashion a feather of encouragement and faith—and give it to him. He'll fly, brother! He'll become one of the star performers in your production circus.

Contributed by LEE MARION, Middletown (Pa.) Air Depot

A Time-Study "Refresher"

A. B. CUMMINS, Assistant Professor of Industry, Wharton School, University of Pennsylvania, Philadelphia

Has your time-study department mushroomed? Has it always found the qualified, experienced talent it sought? Do the analysts represent varied backgrounds?

If you have answered "yes . . . no . . . yes" you are normal. If you answered otherwise, you have cracked under the strain. In various contacts with Philadelphia industry I have observed many problems of adjusting new time-study observers to duties far beyond them. Through evening time-study classes many cases are revealed of outright "bluffing it through" under every combination of circumstances, including experienced men in greener pastures with "no time to study the manual."

A great deal of harm is resulting from shutting our eyes to the potential dynamite in our midst. Unfortunately, the weakest spots in our armor, leveling and rating, are most sensitive to the conditions noted. The assumption of uniform evaluating judgment in a time-study group is most vulnerable under ideal conditions; under present growing, shifting personnel problems, it is absurd.

Before conducting rating exercises in the Wharton School Industry Laboratory the following simplified case is presented to impress upon the men the dire consequences of two analysts establishing piece rates for different jobs in a plant with different conceptions of an average performance in mind. They may be experienced in operations of their previous connections, but quite new to this plant. One analyst goes to job *A* and levels his operator's performance 1.10, but it should have been leveled to 1.20. The other analyst goes to job *B* and levels his operator's performance 1.00 but it should have been 0.90. They incorporate a 20 percent bonus in the incentive rates, so that the comparable earning possibilities of average performance, under the resulting rates, in terms of the base job rates are:

Job *A*

$$\frac{1.10}{1.20} \times (1.00 + 0.20) = 1.10$$

Job *B*

$$\frac{1.00}{0.90} \times 1.20 = 1.33\ 1/3$$

Now if both jobs happen to have the same hourly base job rate, say $0.75,

DATA SHEET GROUP RATING

PART I WALKING

Study	Rating	Group Ratings	Calculations	Selected Rating
1	60	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26		
		Calculate: $\frac{\text{Your rating}}{60} \times T = \text{Allowed time}$	Yours: Group:	OK:
2	75	80 72 75 70 66 72 72 75 80 78 70 75 66 66 77 78 75 72 66 85 75 72 80 66 70 75		70
			Mine - 75 I am high	+5
3				
8				
		PART II TABLE TOP, ARM MOTIONS		
1	60			
10				

Form provides study numbers and blocks for recording the observer's rating of each study as it is made

workers' checks show average earning rates of 0.825 and $1 per hour, respectively. The consequences of this are too painful and well known to be elaborated further.

When we stated above "leveling factor should have been" we were assuming the probable results that would have been reached if the analysts had had in mind a common, agreed-upon conception of an average performance. This is not an unreasonable expectation. Analysts don't have to be learned and skilled in universal human performance standards—whatever they may turn out to be. They need concern themselves only with uniformity and consistency of time standards in their own bailiwicks.

Our thesis is that a few hours every two weeks spent in a closed group session (1) agreeing upon an average performance for some operation adaptable to laboratory conditions, (2) group rating arbitrarily faster and slower performances, (3) comparing notes, and (4) adjusting differences will pay rich dividends. This is by no means an innovation, but the few departments that use it do so too sparingly. Skill at rating is like skill with a musical instrument—only constant practice will maintain acceptable performance. Movies may be used as exercises for rating, but we find them a bit artificial. Our students have responded much better to actual demonstrations. Their rapid improvement and "getting together" within a ± 20 percent range of an arbitrarily selected 60-point performance has been so encouraging and indicative of results to be expected that we are moved to report to industry. So far about 150 students (armed services have first call) have taken part in these rating exercises in time-study courses.

A working or rating form is provided on which study numbers are printed with a block in which the observer records his rating for each study. On the same line a row of blocks is provided in which the other observers' announced ratings are written, and the final correct, calculated rating (see page 117). Each study is timed by one observer. Consistency is assumed in the "operator" during the study. He attempts to give a uniform performance, and as the observers become sensitive to variations they shout disapproval of fluctuations. A definite, exact routine is followed in each "study," giving a reasonably constant quantitative standard. The observed times are the criteria of the correct ratings for the studies, by the time-honored formula:

$$\text{Observed time} \times \frac{\text{correct rating}}{60} = \text{time for the 60-point study.}$$

It is expected, of course, that observers do not "time" the 60-point base performance and cheat by secret timing and calculated ratings. The whole procedure is designed for self-improvement and each observer can only gain by honest cooperation. It goes without saying that identity of a given rating is ignored by all but the rater himself. He naturally studies his deviations from the measured rating with great care because he and his time standards will be in hot water unless his rating judgment is materially improved.

Simple Studies First

We start with studies of a fixed pattern of simple walking, usually 3 or 4 trips between fixed points. The observers are told to memorize the velocity of a body movement (not the step rhythm which can be and is varied from a constant velocity to trap the unwary) for a study which is arbitrarily called a 60-point performance. This is repeated several times before the "operator" varies his rate of performance. The time observer notes the "time" for each study and calculates the correct rating. We list the various ratings and the numbers of times each was made in the group, on a blackboard, and, last, the correct rating.

Discussion and note comparison are encouraged. After rating the walking operation we turn to a manual, two-handed operation of moving small, easily-grasped objects from four or six symmetrically placed bins to a small work-area container. Five or ten fixed-routine cycles are called a study. Again the 60-point performance is labeled, memorized by the group, and separately timed before arbitrarily changed performances are given for rating. There is probably no point to detailed elaboration of this simple procedure, which interested readers can readily construct in their own minds. Indeed, individual variations will be appropriate to their respective environments.

Some preliminary observations may be in order. This refresher technique is not a cure-all. It is designed to refine the rating judgment of a group about a common denominator of fundamental motions. Something constructive is done about defining a performance standard for a group. What other groups might decide is disregarded. This is a practical necessity. The important thing is uniform results within each personnel unit.

As to group rating behavior, analysis of hundreds of rating sheets would be most interesting, but has not been done yet. Some general observations can be made, however. At the start the ratings will be badly scattered, but most will be in the "right direction." Improvement is rapid, which is a strong recommendation for the use of refreshers. We have not been able to eliminate or even improve upon the rating "scatter" for extremes of performances of more than ± 50 percent of 60-point performance. The "scatter" is worse for the low performances. A decision to study a worker who is not far from "average," preferably slightly better, seems to be well justified.

It appears that after a reasonable amount (a few hours) of discussion of, and practice with, a performance common denominator, a group of intelligent observers will rate variations of performance quite well if the variations are not excessive. Since in any experience every rating exercise by groups has produced shocking discrepancies, the group refresher is suggested as a remedial technique to all time-standards departments.

IF YOUR COPY OF *FACTORY* IS LATE—

Be patient, please. The nation's transportation system is severely loaded. The delay may be unavoidable. Allow a few extra days before writing us. Both the publisher and Uncle Sam are doing everything they can to get your *Factory* to you on time

Supervisory Problems—No. 5

WHAT WOULD YOU DO IN A CASE LIKE THIS?

Fifth in a series of articles on methods used at Carnegie-Illinois Steel Corporation, Pittsburgh, to stimulate discussion in foreman training classes. Developed by R. J. Greenly and E. B. Mapel, Industrial Relations Division

John Doe has worked in X Department for several years and has been a satisfactory employee in all respects. Recently he was appointed to a departmental safety committee and has become deeply interested in safety work. He has regarded it as his responsibility to detect unsafe conditions, give safety tips to other men, and to report the unsafe practices of others.

At first, this pleased John's foreman, and on several occasions the foreman commended John for his extra effort. Encouraged by this, John redoubled his safety efforts. He began reading safety magazines, developed safety posters for his department, and offered his voluntary, spare-time service in the promotion of safety in his community.

Soon the foreman noticed that John's work was dropping off badly, apparently because he spent so much time away from his job on his safety activities. Since John was a tractor operator, his poor work on several occasions caused serious delay and much grumbling among the men he supplied. John came to his foreman and reported that he had been threatened by some of the men to whom he had given unsafe practice "tips." On two occasions the foreman had to intervene when other employees became angry at John for trying to tell them how to do their job more safely. It was charged that John was the foreman's spy, whose job it was to "get something on" the men.

Even though his safety efforts were of questionable value, John was encouraged in these activities by the plant safety director. The safety director felt that it was extremely important to encourage safety consciousness and that it would seriously hinder his program if John were to be reprimanded. Such a reprimand might be considered an example of management's ingratitude for special safety effort. The safety director threatened to take up with top plant management any action the foreman might take to hinder John's safety work.

The following statements apply to this situation. Study each one carefully. If you agree, put a circle around the "T" following the statement. If you do NOT agree, circle the "F". If you are in doubt, circle the "??".

1.	John should be disciplined for the increasing neglect of his work even though it is caused by safety activities.	T	?	?	F
2.	An attempt should be made to find John a full-time job with the safety division.	T	?	?	F
3.	The foreman should not have allowed John to report unsafe practices committed by other non-supervisory employees in the department.	T	?	?	F
4.	All safety promotion work should be done by non-production employees.	T	?	?	F
5.	John should be transferred from the department in order to quiet the suspicion that the foreman maintains him as a spy.	T	?	?	F
6.	John's safety activities should be encouraged even at the expense of his regular duties.	T	?	?	F
7.	The other employees were not justified in objecting to John's activities.	T	?	?	F
8.	John was probably just trying to "polish the apple" to gain the foreman's favor.	T	?	?	F
9.	Since John's effort had little practical influence on the departmental safety performance, he should be required to stop it at once.	T	?	?	F
10.	The safety director should not have encouraged a non-supervisory employee in safety activities.	T	?	?	F
11.	It is difficult adequately to promote safety without raising production costs.	T	?	?	F
12.	The responsibility for action in this situation lies with the foreman alone.	T	?	?	F
13.	Responsibility for recommending action lies with the safety director.	T	?	?	F
14.	Safety work done by men who are not trained safety engineers is not worth the effort.	T	?	?	F
15.	The safety director, as a staff officer, has no right to attempt to force a foreman to cooperate in the safety program.	T	?	?	F
16.	The foreman who does not cooperate fully with staff safety representatives should be reprimanded.	T	?	?	F

Scrap Goes Back to Work

RICHARD B. COLE, Supervisor of Reclamation Department, Bell Aircraft Corp., Buffalo

GREAT QUANTITIES of scrap material pass daily through the salvage disposal building at Bell Aircraft Corporation, where the "junk business" has been developed into a highly specialized, highly integrated program, successfully designed to enable reclamation of every possible ounce of raw material. During the two years that the builders of the Army P-39 Airacobra have been perfecting this factory scrap-saving program, many thousands of dollars' worth of material has been turned back for reprocessing and re-use in war production.

Big Business

What is most important is the fact that in ordinary times much of this material would have been lost to production. The reclamation division of the company, in large part, owes its present-day importance to a national directive issued by WPB in 1941. At that time, Bell Aircraft followed normal factory practice regarding its disposal of scrap, but the WPB directive emphasized the need for utilizing previously lost scrap in order to make up potential raw material deficits, occasioned by the tremendous production expansion of the nation. The result has been a "junk business" amounting to as much as $100,000 per month.

Collecting tons of scrap, much of which is shipped to processing concerns, doesn't afford the personnel of the department a vivid picture of their important part in the war effort, but the department has not been left wanting for a definite role in Airacobra production. More than once the reclamation department, with its rooms stocked with "reclaimed everything," has furnished minor assembly parts in enough quantity to keep the assembly lines moving during the critical period between the exhaustion of one shipment and arrival of the next. And, more than once, broken tools that have been reworked in the reclamation department have kept important machines turning over.

During two years of war, personnel of the division has increased from 9 to 235. More than 60 percent of the department employees are women. Assigned to four different divisions of the department—scrap, oil reclamation, wood reclamation, and standard parts sorting—these employees comb the plants for waste on all three shifts, gathering together into uniform collections everything in sight that ordinarily would be classified as waste.

Small assemblies are here being reclaimed from scrap parts and will go back into production. Women do much of the work in the reclamation department at Bell Aircraft. Operator in foreground is using a modified riveting machine to punch rivets out of the assembly

The department was organized in April, 1941, for the purpose of salvaging 24ST, 52ST, and miscellaneous aluminum alloys, together with stainless steel. They were the materials specified in the first WPB directive. Prior to that time, chips and some other scrap metal were sold just as swept up. Today the department salvages everything, including wood, brass, magnesium, oil, steel wool, lead storage batteries, Plexiglas flake, wire, paper, floor sweepings, burlap, hand files, gloves, screws, nuts, and bolts.

Standard parts division of reclamation department works 24 hours a day, employs 52 women and 4 men. Girls at bench are sorting bolts by type, diameter, length, and thread. Man in background is inspecting finished work prior to returning it to regular company stockrooms for re-issue to production

Each of the four divisions of the department operates as a unit with specific chores. The scrap division accumulates, segregates, and disposes of all waste metals and materials except oil and wood. Three locations where the bulk of this scrap accumulates are the press department, shear department, metal fabrication and machine shop. Two women and one man cover each of these departments on each shift, the women assigned to collect the scrap and the man to move loaded drums.

All drums, once filled, are covered and locked to guarantee segregation of material and to prevent contamination by mixture with foreign materials. All work orders include specifications of the type of material being worked. Women of the reclamation department simply glance at the work order to determine the exact type of scrap accumulated at any particular machine.

Two girls are stationed permanently in the inspection salvage department, where they segregate all rejected parts by type of alloy. The material these girls claim for the reclamation department is the material that inspection salvage cannot rework. When material reclaimed here is returned to the scrap disposal building, it is stripped of all usable assemblies, and those assemblies are put back into regular stock. Also going back into regular stock are any blanks or cutoffs that accrue in the press or shear department and which measure more than 6x6 inches.

Nothing Is Missed

Roving collectors cover such departments as drop-hammer, foundry, templet and die making, fixture-erection, and welding—departments that do not accumulate enough scrap to require the full time of a salvage worker.

In assembly departments are large drums with mesh tops, and into these drums janitors dump all their sweepings. The mesh top screens off large particles of paper and metal from such items as screws, bolts, and other small parts. The larger items are then taken from the top of the drum while the smaller items drop through the mesh wire along with dust. The dust and small parts are later sifted at the scrap disposal building, thus facilitating reclaiming of the parts.

At the fabrication plant, drums are placed at all time clocks and employees leaving the building are requested to search their pockets for odd small parts they may have forgotten. More than 8000 items are deposited in these drums every week, which means approximately 300 pounds of parts going back into the war effort instead of ending up in trash cans at the employees' homes.

Drums marked for specific materials are located in departments. Men roll these drums, when filled, to pick-up stations where they are picked up and transported to the disposal building by one of two tractors utilized for this

Drums marked for specific materials are spotted in the various production departments. When filled they are rolled to stations where they are picked up and hauled by tractors to scrap disposal building

purpose. As a loaded drum is carried off, an empty drum is left in its place.

The reclamation department attempts to handle all collection itself, and thereby avoids having an uninterested department dump loads of unsegregated material at the scrap disposal building. The only instances where other departments work into the collection system is in scrap paper, which comes from the janitors, and structural steel, which comes from maintenance.

Once the accumulated scrap reaches the disposal building, it is made ready for either sale or return to the plant stockrooms. All 24ST and 52ST aluminum chips are briquetted according to type and stored until amounting to a freight-car load, when they are delivered into the freight car on a gravity roller conveyor. Other chips or solids are held in the original container as they are received from the various departments, and are stored until enough of any particular type of alloy is accumulated to make a regular shipment.

Millings, borings, and turnings are placed in a "crusher" which breaks large pieces of metal into flakes. The metal flakes are passed through a centrifuge for the removal of cutting oils and then shoveled into bins located directly above car platforms. When there are enough metal flakes to fill a freight car, they are shipped away to the processor.

Operations in the disposal building are arranged to avoid confusion and loss of time. Material is brought directly from the plant to an elevator which carries the loaded trucks to the top floor of the four-story building, where millings, borings, and turnings are dumped into the "crusher" and automatically discharged from there to the centrifuge on the third floor. From the centrifuge, the material is transported by monorail to bins above the railroad tracks, which run through the building.

Paper, cardboard, burlap, and excelsior are transported to the scrap disposal building in large wagons hauled by tractors. The material is taken to the fourth floor by elevator and there dumped into an inclosure through which passes one end of a reversible belt conveyor built flush with the floor. The opposite end of the belt conveyor passes through a similar inclosure which, until the conveyor is put in operation, remains empty.

An operator stands in a recess in the floor at a spot approximately at the center of the conveyor. At each side of the operator are bins running from the fourth floor to the second floor of the building. Paper is placed in these bins according to rag content. To sort the paper, the operator starts the conveyor in one direction so that it runs out of the inclosure filled with material. The material is carried on the conveyor and as it passes the operator, she first sorts for paper and cardboard respectively. She then stands on the opposite side of the conveyor and reverses the direction of the belt. The belt then carries out of the inclosure, which had originally been empty, the material that had not been selected in the first operation.

From the opposite side of the mechanical carrier she finally selects

Some 8000 parts are turned back into production weekly by workers who empty their pockets as they punch out at shift's end

burlap, excelsior, and ribbon paper, respectively. As the material is sorted, it is dropped in proper bins. Paper and cardboard are discharged from the bins to the mouth of a paper baler and, when baled, it is removed to the first floor ready for shipment by freight car to its destination.

The oil reclamation division of the department salvages four-fifths of all lubricant used in the shop, the salvage amounting each month to approximately 1700 gallons of hydraulic oil, 2000 gallons of general-purpose shop oil, and up to 10,000 gallons of cutting oil. The oil, which really never "wears out," is reclaimed at one-fifth of its original cost, and the company saving in oil ranges above 70 percent.

The function of the standard parts division of the reclamation department is to sort out all parts from floor sweepings. The sweepings are placed in drums and the drums are

delivered to the scrap disposal building. Removed from the drums, the sweepings are placed in a foundry riddle or vibrating screen. The dirt and fine particles of metal fall through the screen, and the paper and large pieces of metal are picked off the top.

The residue goes through a magnetic separator which distinguishes the ferrous from the non-ferrous materials, and leaves the dirt to be disposed of. Leaving the magnetic separator, the material is shipped to the Goodwill Industries of Buffalo where handicapped workers sort material into eight items—i.e., nuts, bolts, screws, skin fasteners, washers, hardware, rivets, and scrap.

Material returned to the disposal building from Goodwill Industries goes directly to the sorting room where 52 women and 4 supervisors are employed on the three shifts. Steel bolts are classified in the first operation by types, such as standard aircraft hex head, round head, square head, Allen head, carriage, and maintenance bolts.

The types are further sorted according to diameters, then according to lengths, and finally according to thread. The completely segregated material is finally inspected, and usable material is turned over to the plant inspection department, which in turn returns it to the plant stockrooms as regular, workable material.

Materials are sorted on a smooth surface and into pans placed directly in front of the operators. Never are more than seven pans used at one time. Through this method, operators save valuable time by pulling the material off the surface and into the pans without having to pick up the small material.

The wood reclamation division receives all used wood from the janitor and maintenance departments, which make the deliveries to a wood shed outside the Buffalo plant. Wood is salvaged from all types of boxes, including those in which aluminum alloy sheet is delivered to the plant, and those in which structural steel and maintenance items are purchased. Barrels and kegs also make up a large portion of salvaged wood.

Broken boxes are knocked apart, nails are pulled, broken sections are trimmed on table saws, and the material is stacked in the yard according to type, thickness, width, and length. Most of the material reaching the wood division is re-used in the plant by either the shipping or maintenance departments. Items that cannot be re-used are sold to the employees and the public, and in one instance the division reworked short lengths of lumber into pickets for fences. The pickets are sold for use in Victory gardens, chicken inclosures, and the like.

Pipe, fittings, structural steel, and maintenance supplies also are handled by the wood division. For the most part they are reworked and delivered back to the plant. Gloves are laundered and returned to the shop. Used steel wool is processed and sold as such. Wire reels are returned to vendors; straw is reclaimed and used for shipping purposes; exposed X-ray film is sold by the pound; leather and rubber of all types are salvaged and returned to war production; leaky pails, broken tools, and tubing are some of the other thousands of items collected and made ready for re-use by the reclamation department at the Bell Aircraft plants.

Aluminum scrap, segregated by type, is briquetted and stored until there is enough to fill a car. Gravity conveyor speeds loading

Balancing the Books

Nothing goes through the scrap disposal building that is not fully accounted for according to pounds, units, and value in dollars and cents. Reclaimed material is sorted for re-use as raw material within the plant, or for sale. In placing a value on the material that goes through the disposal building, current market prices for the material are always used.

About 80 percent of the reclaimed material goes back into war production in the Bell Aircraft plants. The other 20 percent is sold. After the material is sold, it is charged out of the disposal building in two ways—money or checks where it is sold to an outsider buyer and a credit material requisition form when the material is returned to company stockrooms. In either case, the scrap disposal office has all salvaged material accounted for and books that balance.

Six Tested Ways to Safety

JOHN B. DUNNE, Director, Auxiliary Defense Corps, River Works, General Electric Company, West Lynn, Mass.

TOO MANY PERSONS have come to think of safety as something which can be administered by "long distance." This concept has done much to harm the cause of accident prevention. It should never be forgotten that safe practices are still learned best in a "man-to-man" relationship. There is always the danger that, as a safety program increases in size and scope, the personal element will gradually disappear and mass production methods replace sound, educational processes. When this occurs we find the safety department relying on posters, pamphlets, news items, and possibly an occasional contest.

Personalized Safety

What we need to cope with the rising tide of accidents is a rapid return to a personalized safety program. General Electric, like other large companies, has found the value of adopting a personal approach to the accident prevention problem. In general, the results have been gratifying, and in spite of our hundreds of inexperienced workers, accident records have improved.

The personal approach can be achieved. Here are suggestions:

1. **Capture the interest of the new employee.** This is not too difficult a task. The new employee can prove an asset to the safety effort, or he may easily become a grave liability. Accident reports show how many "green" recruits end up under medical care as a result of an accident.

Recently I was in the employment office of a large manufacturer of war material in the East and saw several men employed for jobs in this plant. These new employees were given several cards and a couple of pamphlets, and then sent out to the foreman under whom they were to work. One of the men left his cards and pamphlets on a bench, and I retrieved them. There were mutual benefit cards, explanations of plant rules, and an excellent book put out by the safety department. This publication was attractively bound, and between its covers was a great deal of good, sound safety sense. It was well illustrated and must have been an expensive bit of printing. *But it was left on the bench!*

New women workers are impressed with the need for safety. They are required to secure safe clothing, wear goggles, safety shoes, hairnets

There was no doubt that the safety manual had been wasted on this particular workman. How many more times is the manual wasted when it is passed out to the new employee?

The message of accident prevention is too valuable to be wasted in this way. It should be told and retold, passed from one worker to another, and kept alive and vital. Only when it is, can safety be made an entity rather than a slogan. You cannot just hope that new employees will somehow learn to work safely. They probably will not.

We follow the practice of distributing our safety booklet at a meeting for the new employees held under the direction of foremen. The foremen discuss salient points in the pamphlet at the meeting. Points pertaining to the type of work each employee will be doing are emphasized subsequently by individual instruction. The safety director helps the foremen to prepare their talks for the meeting. He periodically follows up the meetings to make sure the greatest good is being derived from them.

2. **Place new men under the guidance of safe workers.** We find that in each department and on each job we have men who have lost little or no time through an accident. We select these men to supervise new employees, not only because their record qualifies them for the assignment, but also because we know the new worker will respect their advice and teaching.

This is a help to the foremen, because many of them do not have the

New workers are placed under the supervision of old-timers with good safety records, who instruct the newcomer in safe operating methods

time to devote to safety training and supervision.

We have found that placing the new man under the guidance of a safe worker is an excellent means of personalizing the safety program. You cannot just turn a new worker loose and expect him by some strange good fortune to learn the safe way to do his job. Let him learn from someone who has proved himself to be a safety-conscious employee. Thus, by observing the skillful, safe way of doing his new job, the new employee develops habits which will make him an asset rather than a liability to our plant and to our victory effort.

3. **Place new employees under a program of safety and first aid training.** It may not be possible to have classes in accident prevention for all employees in a plant, but, while a worker is green, he should receive periodic instruction. This should include specific instruction in accident prevention on his job and in the plant in general. We use movies, sound slide films, demonstrations, and talks to get the story across. Discussion by the new men is encouraged, because the best way to make them think about the subject is to allow them to talk about it. Discussion is especially encouraged after the movies, many of which are necessarily general in nature, because it provides an opportunity to reemphasize the safety lesson portrayed in greater detail.

Some of our plants, and other manufacturers whom I have visited, have taken advantage of first aid training as a means of introducing the employees to the safety education program. The standard Red Cross course is helping tremendously in promoting safety. It has been our experience that the persons who take this training soon become interested in the entire program of accident prevention in the plant, on the highway, and at home. Many plants have reported that workers who have taken first aid training are 50 percent less likely to have an accident than those who have not been trained. Workers who have had a good course in first aid are more conscious of the dangers of infection, and they are much more likely to seek medical aid promptly for small injuries. They also realize the seriousness of moving injured persons improperly, and their desire to protect the victims of accidents has often proved a factor in the speedy recovery of an injured person.

4. **Increase the size of existing safety committees.** In our plant those who have been given training in first aid, and other interested employees, have asked to be given something to do about preventing accidents. These people have been placed on the safety committees in their buildings, and they have usually done a fine job. Because they are "new brooms" they "sweep clean." They stimulate interest in new ideas for safety which might be overlooked by employees who have been on the committee for years and have got into the habit of traversing the same ground over and over.

One of our department heads recently created a special wartime safety committee in his building. He included over a hundred persons on it and gave each a distinctive badge. He was soon swamped with requests from employees who wished to join the committee. The record of this department in cutting down accidents and removing hazards has been almost phenomenal.

5. **Survey your past accident record and direct your activities accordingly.** No two plants have the same specific problems in accident prevention. There are general over-all safety measures which concern all our plants, but each plant has safety problems peculiar to the particular type of work it is doing.

For instance, one of the General Electric plants found that it was having an increasing number of eye injuries, some trivial, some serious. The type of work done in this plant was such that it produced many hazards to the workman's eyesight. The safety engineer of this plant decided on an all-out eye protection campaign, to

Executives as well as plant employees are taught the rudiments of first aid. Here they practice moving an injured man

Artificial respiration is one of the "musts" in a safety training program. Workers who have learned first aid are 50 percent less likely to have an accident

include all workers in the plant. The results of these efforts have been gratifying, and eye injuries have been reduced to an absolute minimum.

Since our plants produce varied types of electrical equipment, certain electrical hazards present themselves. To offset this, the company has for years aggressively conducted a widespread program of training in artificial respiration, and the records of the safety department show that this training program has paid for itself many times over.

6. **Don't forget the girls.** How many of us working in industry would have believed two or three years ago that this year we should have women operating planers, multiple borers, lathes, and even running cranes and fork loading trucks? But such is the fact—and for the most part they are doing a swell job. It is interesting to note that most women workers have a better safety record than men. By and large, they follow directions better, engage in less horseplay, and, in general, "stick to their knitting."

We try to capitalize on this propensity for safety on the part of the girls. When new women employees enter our plants they are impressed with the need for safety. They are taught their work under an employee with a good safety record. They are required to secure what is considered the safest clothing for their job. The reasons for use of such equipment as goggles, safety shoes, and so on, are pointed out to them, and few of them seem to try to get by without these essentials.

It does not hurt to set up a little competition between the men and women of the plant, to see who can maintain the best safety record. From what we have seen already, the girls will win in a walk.

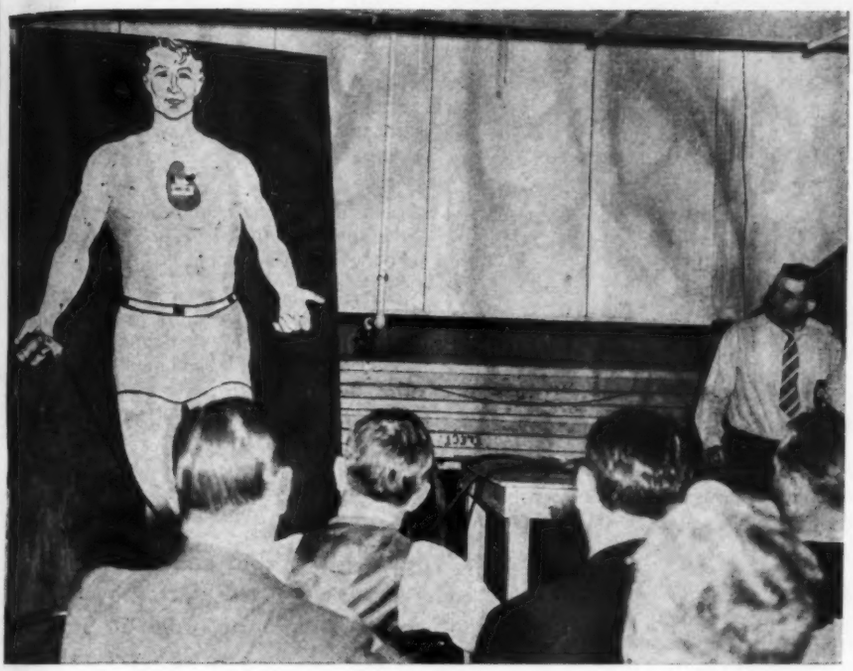
We have found that the right kind of publicity can do much to help the safety program. We try to use publicity to educate and commend. News releases are directed at specific hazards or unsafe practices. We avoid the "Be careful, don't get hurt" publicity. Commendation of safe workers and occasional pictures in our plant papers are used to stimulate interest in safety. As is only natural, commendation is a far better incentive to safe practices than criticism.

We never let up in our efforts to make safety popular. When the employees, old and new alike, learn that accident prevention is pleasant and pays dividends, they are more inclined to cooperate. Our safety department does not function as a policing agency but rather as an educational body. Investigation of accidents and placing blame give way to preventing accidents and teaching workers skilled safe practices.

Today we try to capitalize on the universally held desire for victory in promoting safety. Ships and tanks and planes cannot be manufactured if accidents interrupt production. We try to enlist the aid of every worker old and young to declare war personally on the arch *fifth columnist*, accidents.

MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for



Life-sized dummy shows flow of current through human body when improperly wired tools are handled. Convinced workmen that clumsy repairs are unsafe

Dummy Shows Improper Wiring Hazards

SOURCE—Curtiss-Wright Corporation, Airplane Division, Buffalo, N. Y.

In order to emphasize the hazard of electrical repairs attempted by unqualified workmen, a demonstration of the flow of current through the human body from improperly wired tools was prepared.

Arthur E. Soderholm, electrical engineer, wired a life-sized dummy from hand to hand through the heart and down the side to a ground at the left foot. He used the dummy in lectures to an aggregate of 400 supervisors with the result that the electrical department was deluged with defective electrical equipment from workmen convinced that clumsy repairs are unsafe.

A correctly wired portable electric drill and a portable light on extension cords were placed in the dummy's hands, where suitable receptacles held them in operating position, and were shown to be perfectly safe with power on. Then, simulating self-repairs by workmen, two of the drill cable wires were changed so that the ground wire was reversed with one of the phase wires. This electrified the case of the drill so that, although the tool still operated properly, 220-volt, 180-cycle current surged through the dummy's body, making the resistance wires glow and writhe. Reversal of ground and phase wires of the lamp produced the same result. A third step demonstrated that when one tool was connected properly and the other improperly, current would flow through the dummy's body.

Finally, the hazard of jumping fuses by soldering heavy wires to their outsides was stressed by placing such a doctored fuse across the dummy's heart and comparing the results when current was passed through it and through a normal fuse. In the former case, the wire parted with explosive force, while with the normal fuse the current ceased to flow almost immediately as the fuse wire burned through at once.

These metal spattered safety goggles tell their own story. A babbitted bearing blew from its casting during the pouring operation, and flung hot metal into a worker's face at the Midwest Manufacturing Company, Galesburg, Ill. His safety goggles saved his eyesight

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Work Simplification Applied to Collating

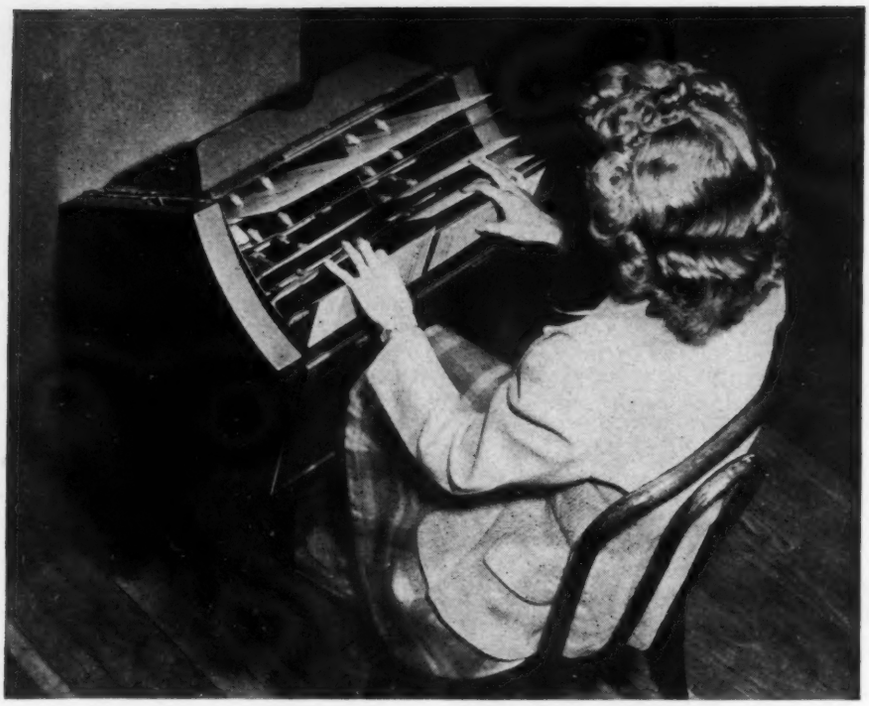
SOURCE—Vultee Aircraft, Inc., Nashville Division, Nashville, Tenn.

Time in collating or gathering numbered sheets of paper has been cut appreciably by the development of a mechanical collator which gathers approximately 360 sheets per minute compared with the old rate of 75 by hand.

Designed and built by J. M. Druliner, chief of methods and controls, and Matt Hilger, foreman of non-productive manufacturing, the collator has a gathering capacity of 12 sheets in two groups of six each. It takes legal-sized paper and has an adaptor for standard 8½x11 sheets. There are twelve bins, each having a sheet capacity of approximately 500 letter-sized sheets. The bins are constructed in two semicircular tiers with their planes conforming to the radii of a circle. Their open ends are set toward the center of the circle in such a manner that when the two parallel groups of six sheets each are fed from these openings, the ends of the sheets converge toward the center where they may be grasped by the operator and withdrawn from the machine.

Six transverse rods are mounted through the machine and guided by radial slots in the sides and center partition. Each rod extends across two bins in a plane above the sheet stacks and in an operative plane parallel to the feeding movement of the sheets. Coil springs attached to both ends of each rod retain the rods in their normal starting position near the back of the guide slots, and yield to the forward feeding movement exerted on the rods by the foot pedal leverage.

Spring-mounted feed arms equipped with soft rubber friction fingers are attached to the transverse slide rods within



Mechanical paper collating machine gathers approximately 360 sheets per minute compared with the old rate of 75 by hand. One operator can complete the same amount of gathering formerly done by four to five workers

each bin so that they contact the centers of the paper stacks with a light downward pressure sufficient to move one sheet from each on the outward radial movement of the assembly.

Since each stack of sheets is retarded by gravity toward the back of the sloping bins, and since the gripping action of the rubber feed fingers against the sheet stack is greater than the dragging friction between sheets, the tendency is for a single sheet to slide forward from the top of each stack. The under sheets either remain stationary, or lose enough ground on the forward motion to drift back by gravity toward their starting position.

For reloading, a back pressure on the heel of the foot pedals causes the feed arms to raise above the feeding position, allowing clearance room for new stacks to be inserted in the bins.

Used principally in the reproduction department, it has been found that with this machine one operator can accomplish the same amount of gathering in a given time that it formerly took four to five workers to complete by hand.

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How to Change the Face on a Stop Watch

EVERETT LAITALA, Instructor, Industrial Engineering, University of Minnesota, Minneapolis

Stop watches graduated in decimal minutes for use in time study work are hard to get these days. Stop watches graduated in seconds and fifths of a second are still available and can be used for time study work after a fashion, but taking readings and making conversions to decimal minutes is inconvenient.

Here are six steps for converting such a watch to decimal minutes by merely giving it a new face:

1. Photograph the face of a decimal minute watch. Before photographing remove the watch crystal. The hands do not have to be removed, but can be blanked out by retouching the film with material obtainable from a photo supplies store.

2. Make a print (enlarged to actual size) on lightweight paper.

3. Cut holes in print for stems of large and small hands and trim print to size.

4. In order that the new face can be mounted without removing the hands, cut the print in two parts.

5: Apply a coat of rubber base paper cement to each half of the new face and also to the face of the watch. Allow to dry.

6. Position carefully one half the new face and press down firmly. Similarly assemble the other half of the face, and wipe off excess cement.

In case the first attempt in fastening the parts to the watch is not successful, it is a simple matter to remove the parts, wipe off the cement, and repeat the process. The result is an easy-to-read stop watch contrived quickly at small expense.

•

Last word in subcontracting is Westinghouse's farming out a piece of a war order to Purdue University's machine shops, where 275 engineering students are working part-time. Their production equals the output of a 75-man shop.

Hazard Spot Card

Check every step of every job against the hazard spots

1. WORK AREA
   - a. Housekeeping—tripping, slipping
   - b. Illumination
   - c. Storage—piling, floor loads
   - d. Cramped quarters—corners
   - e. Stairs—inclines
   - f. Blind exits
   - g. Aisles
   - h. Ventilation
   - i. Holes, excavations
   - j. Exposed surfaces—electric, hot

2. MATERIALS HANDLING
   - a. Rough, sharp
   - b. Heavy
   - c. Long
   - d. Slippery
   - e. Fragile, explosive, flammable
   - f. Acid, alkali, poisonous, hot

3. MACHINES
   - a. Point of operation—cutting, punching, forming, etc.
   - b. Power transmission—line shafts, other shafting, belts, gears
   - c. Pinch points
   - d. Projections
   - e. Flying pieces

4. TOOLS
   - a. Proper tools
   - b. Proper use of tools
   - c. Proper place for tools
   - d. Proper condition of tools

5. IMPROPER CLOTHING
   - a. Loose, ragged
   - b. Flammable
   - c. Neckties, jewelry
   - d. High heels, thin soles

Prepared by Safety & Security Branch, Office of Chief of Ordnance Explosives Safety Training

MAINTENANCE SERVICES

The well-maintained plant is the high-production plant

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

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FACTORY MANAGEMENT AND MAINTENANCE
McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

Deferred Maintenance Reserves—a Vital Post-War Need

Let the Treasury issue special government bonds to taxpaying corporations to cover maintenance expenditures that should have been made during the war, but which have been postponed because of shortages of materials and labor or for other good reasons. Let these bonds be cashable over a period of three or four years after peace comes.

In essence this is the proposal made by the Baltimore Citizens Committee for Post-War Planning. The problem that this proposal attempts to solve is of direct interest to every plant operating executive.

Few plants can now find the men, materials, or time to do all the maintenance work that should be done on equipment and buildings. Equipment of all kinds is wearing out or deteriorating at a faster rate than normal, because it is being pushed to capacity upwards of 24 hours a day.

In the post-war period there will be plenty of work for the maintenance department, because the damage resulting from all these months, perhaps years, of capacity operation or overloading, and neglect, must be repaired. No plant can expect to meet post-war competition with half-wornout equipment.

Where to get the money for all this maintenance work is something that, as matters now stand, would be left to each plant to work out in any way that it could.

Under present laws, maintenance costs are deductible from income, for tax purposes, only if the money has actually been paid out. No deduction is permissible for funds set aside for future use. Such funds are taxed as though they were income available for distribution as dividends to stockholders. Since the tax amounts to 40 percent, and may reach 80 percent under the excess profits levy, setting up deferred maintenance reserves is a costly undertaking. Raising the necessary money in the immediate post-war period might also be costly and difficult.

Existence of this problem has been recognized by the Senate Finance Committee. Its chairman, Senator George, has consistently supported the idea that the tax laws should permit industry to build up reserves for plant maintenance and betterment after the war. Last year the Senate Finance Committee approved a provision that permits corporations to carry losses back or forward for two years. Under this provision, if heavy post-war expenditures for maintenance caused a corporation to suffer a loss, say in 1945, assuming this to be a post-war year, it would be permitted to re-open its tax returns for 1943 and 1944, and charge its losses against profits made in these years. A refund might thus be obtained.

Although it offers some hope of relief to a plant that faces an extensive post-war maintenance program, the present provision has two definite disadvantages: A plant or corporation does not know how much money will be available from possible refunds; and the government can't tell how much of the wartime tax money it can keep.

The Baltimore deferred-maintenance plan not only does away with both these disadvantages, but also provides a couple of positive benefits: (1) Reserves for postponed maintenance would be tax-free, just as though they had actually been spent; (2) since the reserves would be invested in a special series of government bonds, the Treasury would have full use of the money they represent, at a time when it needs all the money it can get.

Cashable over a prescribed period following the war, these bonds would give industry a definite amount of money for maintenance, regardless of business conditions.

The Baltimore plan deserves, and doubtless will have, the support of every plant executive.

Daily Oiling Saves Motors

G. W. DONOVAN, Plant Engineer, Monsanto Chemical Company, Monsanto, Ill.

EXPECTING THE OPERATOR of a piece of equipment to see that it is oiled regularly and adequately, is a delightful theory. Like so many nice theories, its sole fault is that it often fails to work. We have tried it, and from time to time we still do our best to induce some machine operator to take care of oiling his equipment under special circumstances. After all these experiments, we are prepared to report that it is the exceptional operator who will really do a good job of oiling. The typical operator's attitude is that what he is after is production; if the machine breaks down—whether from an unoiled bearing or any other cause—there must have been something wrong about the way the mechanical department set it in the first place.

Oilers Rotate

The consequence of our creed is that we keep a force of men in the maintenance division, charged solely with the duty of oiling. The force varies from day to day, because we have to stagger the shifts to leave a half-strength crew available on Saturdays and Sundays, which are working days for production departments, but days on which maintenance exercises merely a protective function.

Each man has a definite territory within the plant to look after. He keeps his territory for a month, then moves on to the adjacent district. This rotation assures us that even though a given oiler slighted some bearings, through inadvertance or negligence, they will probably be adequately oiled when the tricks change —and maybe it will not be too late.

Roughly, the entire plant's bearings have been divided into equal portions, which means that each oiler has responsibility for about 1400. In each territory, the oiler is given a list of about one-third of these, or from 400 to 500, which are the vitally important bearings in his charge. The list not only identifies the bearings so that he can find them, but also specifies the type of oil or grease to be used.

Mind you, he is not supposed to traverse the department with an oil can in one hand and the list in the other. Rather, he is supposed to memorize these bearings and their proper lubricants. This is not so hard as it may sound, because he quickly learns that all shaft hangers with pillow blocks get one grade of material, all centrifuges of the size most commonly encountered in our plant another grade, and so on. An oiler may be excused for occasionally skipping some of the less important grease cups in his care, but if, for even one day, he misses looking at even one of the vital bearings on his list, he is definitely in the doghouse.

The assignment of making the rounds of 1400 bearings daily sounds like a task that would keep the oiler on the dead run. We have had visitors reduce it to terms of a single minute. "That means three bearings a minute," we have been told. "How

New men go over the territory with older workers, who explain the ins and outs of keeping machines in order by proper lubrication

on earth can you expect a man to oil three bearings a minute?"

Our answer is that we expect no such thing. We expect the oiler to inspect bearings at the day-long rate of three per minute, to make minor preventive adjustments, and to supply lubricant to those that need it. If any bearing gets into such poor condition that the oiler has to pour oil into it every day, it is time to fix the bearing and quit wasting oil. Actually, the oiler's job consists approximately of 75 percent inspecting and 25 percent oiling. Since many machines have up to two dozen glass grease cups where the oiler can see them at a single look without stirring from his tracks, it becomes apparent that we are hardly asking him to keep on the dead run at his work.

Training the New Man

The new oiler is given a preliminary training, going over the territory with the older men much as a newspaper delivery boy is taken over the route by his predecessor, until he knows its general outlines and many of its details. As the new oiler circulates with the other members of the crew, he learns where the bearings are; he learns the applications of lubricant for the types of equipment most numerous in the plant; he discovers the signs that mean a need of oil and the all's well indications that permit him to pass a bearing with only a quick glance.

By the time he has patrolled his own territory for a couple of days with his check-list in his hip pocket, he can cover 1400 bearings adequately in eight hours, make minor adjustments, supply lubricant where needed, and never raise a sweat, except on the rare day when all his oil cups seem to run low at once.

When an oiler sees a bearing indicating excessive wear, either because the grease runs through or because it starts to heat, he must and does report the condition. We equip him with our regular maintenance department job order blank for this purpose. The report goes to the master mechanic, who sends a man out to investigate the trouble—and to adjust or repair it as needed.

If we had a nice, one-level plant with smooth floors, presumably we could equip our oilers with a neat little cart on which to transport their lubricants and equipment through their territories on their daily rounds. However, a chemical plant runs to assorted levels, and even out-of-doors there are many bearings that still require oiling. Hence our oiler carries a box with

★ The well-maintained plant is the high-production plant

his assorted materials and tools—or even a can full of oil cans.

This method has another advantage, by discouraging the oiler from attempting to carry much oil with him. We are distinctly apprehensive about letting too much oil get out into the plant, where it presents a fire hazard. So we store all our lubricants in a bricked-in oil room, which is under the direct charge of the storeroom. A man from the storeroom goes with the oiler to unlock the oil room, withdraw a day's or a half-day's supply for the oiler on his signed requisition, and lock up again.

One reason why the oiler can get along comfortably with carrying his day's stock of oils is that we have greatly reduced the variety of lubricants used in our plant, compared with what it was a few years ago. It used to be that almost every production foreman specified his pet lubricant for machines in his department, and these needless varieties were supplied as desired. Finally we decided that we were beyond the bounds of economical operating and, in fact, of common sense in attempting to meet all manner of whims.

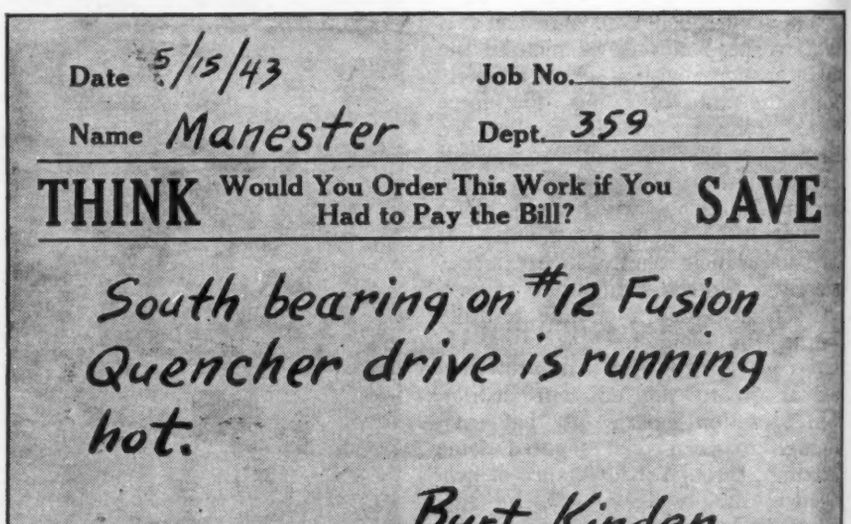
So we called in the industrial lubrication specialists of a petroleum company and asked them to survey our plant and make their recommendations. It took us a while to accomodate our minds to the radical simplifications of lubricant specifications that they recommended. But we eventually reconciled ourselves to the idea that half a dozen greases and oils are a sufficient total to meet all the standard needs in our plant. We still use special lubricants for extraordinary conditions involving excessive temperatures and other special situations. But we shy away from any special lubricating specifications until we have proved to our satisfaction that none of our standard materials will do the trick.

Avoid Special Brands

Frankly, we seldom encounter such a special situation. Many a maker of machine tools or other production equipment sincerely believes that his product requires a special grease. We check his recommendations with our lubricating engineer, then write and ask whether his brand of machine will not run satisfactorily on our standard brand of grease as on the Triple-Refined Bear's Oil that he mentions in his instruction book. Usually he admits it. If he holds out for the fancy brand, we try our engineer's recommendation anyhow.

On a new piece of equipment we try the entire gamut of our standard grades, at least until we hit one that is satisfactory—with the mental reservation that we shall buy a special lubricant if we have to. Thus far we have never had to, except for equipment that runs in heat, cold, excessive dust, or some such specialized set of conditions.

The lubrication engineer comes


Date 5/15/43 Job No.

Name Manester Dept. 359

THINK Would You Order This Work if You Had to Pay the Bill? SAVE

South bearing on #12 Fusion Quencher drive is running hot.

(Signed) Burt Kinder

Oilers are inspectors, too. Each carries job order blanks on which to record bearings that look bad. Reports go to the master mechanic

Author G. W. Donovan talks things over. When an oiler forgets a bearing, and trouble follows, he gets a black mark on his service record. Too many such marks, and he is no longer an oiler

around once a month on his regular round, or oftener if we ask for help with a special problem. We accept his recommendations, and he comes back a month later and checks how they are working out. Mind you, we do not always accept his recommendations without an argument, and occasionally the facts we present induce him to modify his original idea. But we find we do much better by taking the judgment of an expert than we used to do when we were swayed by the purely personal prejudices and preferences of every individual, who might or might not know what he was talking about.

Hot Bearings

Whenever we encounter difficulty with our lubrication and have, say, a burned-out bearing, we save a sample of the oil in use at the time and turn it over to this engineer for analysis in his company's laboratories. For example, a while ago we came within a hair's breadth of really serious trouble on a 1500-kw. motor generator set. A big bearing began to heat, although it was getting plenty of oil. We shut it down before any real damage was incurred, pulled out a sample of the oil, and turned it over to the oil specialist for examination. His laboratory quickly reported that the oil was full of carbon and metal dust, which had caused heating in the bearings. We traced the trouble back to the source, which was work on the commutators while the set was running—without a felt on the shaft, although there had been a washer there at one time. The grit had simply traveled along the shaft to the bearing. We cleaned it out, saw to it that thereafter any work on this equipment is performed properly, and replaced the missing felt washer, thus once and for all stopping the grit at the source.

Unfortunately, for all our care and precautions we still get an occasional bit of lubrication trouble—though nowhere nearly what we considered standard when we were depending on the equipment operators to care for their own oiling. If an oiler fails to keep up his work and any trouble ensues, this goes on his service record. If he gets too many such marks, he is not an oiler any longer. But there are very few such incidents, and our bearings lead charmed lives compared with what they went through only a few years ago.

The cost of half a dozen oilers in a plant as large as ours is well justified by the savings. There are a good many hundreds of dollars a year saved over what would be a normal expectation of bearing replacement costs by our previous experience. There are probably as many thousands of dollars saved by maintaining uninterrupted production because machinery continues to perform its tasks, instead of having to be shut down for hours or days to repair the ravages of improper lubrication.

Add the Savings

For good measure, throw in the cost savings that result from standardization on a few staple-grade lubricants that we now buy in large quantities, at quantity prices, instead of buying scores of different specialty grease and oil items in practically retail units. All these advantages accrue from giving lubrication our serious attention, and putting it on a sane, systematic basis instead of the happy-go-lucky policy that can so easily prevail in this maintenance field.

Work Your Motors Harder, to Save Critical Materials

R. W. MONROE, Motor Division, Westinghouse Electric & Manufacturing Co., E. Pittsburgh

IMPRESSIVE AMOUNTS of critical materials can be, and must be, saved by getting more horsepower out of motors now on hand, as well as more power from the reduced quantities of raw materials that will be available for building new motors.

In the past it has been the policy of many users to apply motors conservatively. If the calculated horsepower of the driven machine was near the rated nameplate horsepower of a motor, many engineers would use a motor of the next larger size to provide reserve for any possible overload condition that might develop, and to assure cool running under normal load conditions. In the past this practice was desirable, but today the problem is different, and many peacetime practices must be modified.

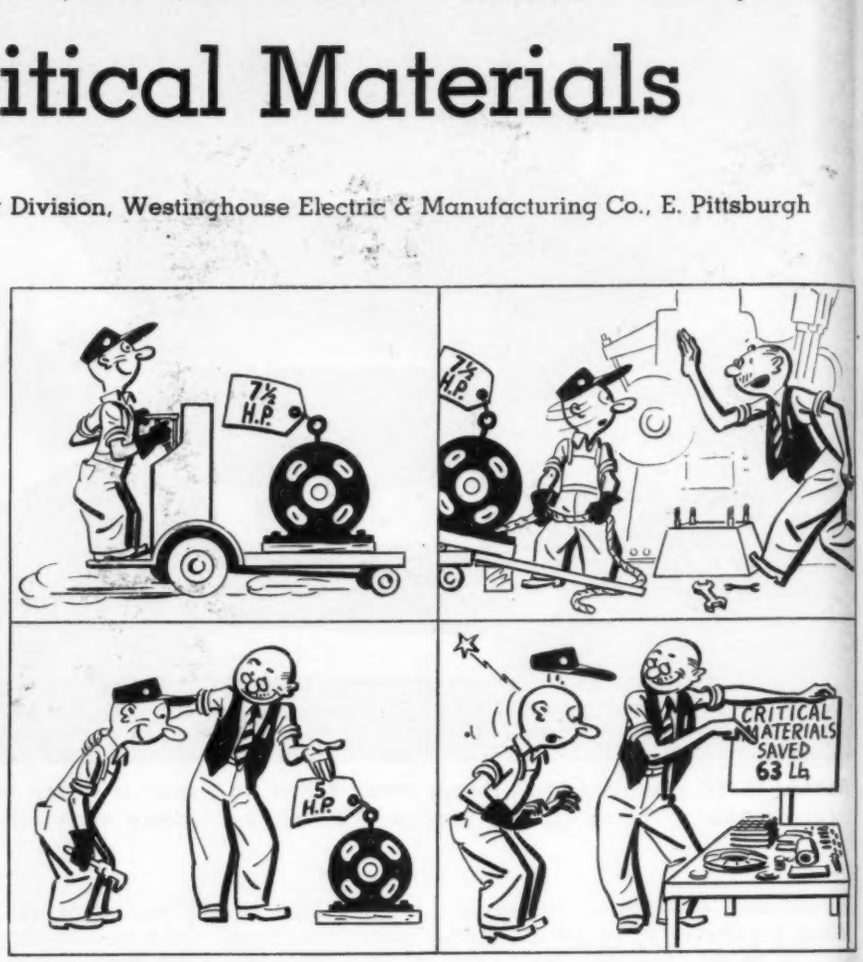
It is generally known that most motors are designed to operate under more unfavorable temperature and overload conditions than are encountered in most applications. As a result, the reserve capacity of many motors driving machines today has been doubled, resulting in a large potential amount of unused horsepower. This reserve horsepower must be called on to do its share in increasing the war effort.

When a motor is to be applied, the actual load of the driven machine must be determined as accurately as possible. Some of the methods for determining the load are:

1. *By test.* Actually load the machine, duplicating the conditions under which it will normally operate. The watts input can then be measured with meters and, when allowance is made for the efficiency of the motor, the exact horsepower required can be readily calculated.

2. *By comparison with power requirements of known loads.*

3. *By accurate calculation of the load.* This method is applied when the load is of such character that formulas will give accurate results. For example, a motor can be properly applied to a centrifugal pump when operating conditions are known and accurate performance curves of the pump to be used are available.



In many plants provision has been made for test instruments to be installed ahead of motors, in order that load conditions can be checked at periodic intervals to determine whether the machinery is properly loaded and operating at its peak efficiency.

Favorable factors that permit increased loading of the majority of electric motors, and which should be taken advantage of in loading them to the limit, are:

1. Overload service factors built into the motor, plus temperature conditions more favorable than those for which the motor was designed.

2. Favorable voltage and frequency conditions.

3. Favorable operating conditions, which may permit use of standard open, sleeve-bearing motors in place of fan-cooled motors.

4. Special conditions permitting use of higher speed motors than normally applied, resulting in the use of smaller frame sizes.

Here is the way to take advantage of overload factors plus favorable temperature conditions:

When applying open-type, continuous-rated, 40-deg. C. a.c. motors where their rated voltage is maintained, and where the ambient temperature is usually substantially below 40 deg. C. and will only occasionally or for short periods equal or slightly exceed it, select an open motor with nameplate rating not more than 80 percent of the actual load imposed by the driven machine. For example, use a 5-hp. motor for a 6¼-hp. load, instead of a 7½-hp. motor, and save approximately 60 pounds of critical war materials.

When applying an a.c. or d.c. motor rated on a 50-deg. C. or 55-deg. C. basis, such as splashproof, totally inclosed, fan-cooled, non-ventilated, or intermittent-rated open motors, where their rated voltage is maintained and where the ambient temperature is usually below 40 deg. C. and will only occasionally equal or slightly exceed it,

select the standard horsepower rating that is not more than 91 percent of the horsepower required, as determined by test or calculation. For example, use a 15-hp. motor for a 16.5-hp. load, instead of a 20-hp. motor, and save 77 pounds of critical war materials.

When applying an open-type, continuous-rated, 40-deg. C. d.c. motor under these conditions, select the standard horsepower rating that is not more than 87 percent of the horsepower required by the driven machine. For example, use a 10-hp. motor for an 11.5-hp. load, instead of a 15-hp. motor, and save approximately 80 pounds of critical war material.

The lower overloading of open d.c. motors as compared with open a.c. motors is recommended, in order to assure reasonably satisfactory life in cases where commutation is the determining factor.

It is recognized, in applying motors in accordance with these recommendations, that where the ambient temperature approaches 40 deg. C. during a high percentage of the time, and the actual horsepower demand utilizes nearly the entire percentage allowed in excess of the standard motor rating, some reduction in motor life may be experienced. Possibly the 20 years' expected life will be cut to 10 years.

Recommended Overloads

The tables show the recommended overloading for various types of motors. These tables apply to 1750-r.p.m. motors in order to show the material savings on machines of this popular speed. Recommended overloads and similar savings of critical materials will apply, however, to all other motors of standard listed speeds.

For new plants or extensions, the War Production Board recommends that the a.c. distribution voltage be restricted to not less than 440 volts. Where motors of 100 horsepower and larger are installed, 2200 volts can be used. This voltage will result in a considerable saving of copper and other materials required for distribution circuits, switching, and control apparatus.

In order to reduce the number of motor leads, specify only single-voltage a.c. motors when possible. On existing systems, check the voltage. If it is below normal, take steps to bring it back to normal, or up to 10 percent above. To do so may, in some instances, constitute a major problem. It is often possible, however, to bring the voltage to normal or above by means of taps on the distribution transformers. Always take full advantage of this possibility, since it permits correction of starting and pull-out torques.

In many instances the installation of capacitors will increase the line voltage and the capacity of the feeder system, by improving the power factor.

Greater utilization of motor horsepower capacity may be secured as explained previously, but it must be remembered that the equivalent starting torque of a given motor remains practically constant regardless of load so long as the service voltage remains constant. In some applications, with normal service voltage, motors may have insufficient starting torque after the overload capacity has been utilized.

For example, assume a 10-hp. open-type a.c. motor having a starting torque of 1.6. The equivalent starting torque is 16 hp. (1.6 x 10), but when loaded to capacity, which according to Table I is 12.5 horsepower, this motor will have a starting torque of 1.28, (16 ÷ 12.5).

In the event that a starting torque of 1.28 is insufficient and it is possible to increase the service voltage as

Table I. Recommended Loading of Open-Type A.C. Motors, 1750 R.P.M., Standard 40 Deg. C. Rise, Continuous

For Maximum Hp. Loads of	Use This Hp. Motor	Instead of This Hp. Motor	And Save These Pounds of Critical Materials
1.25	1	1.5	36
1.88	1.5	2	14
2.5	2	3	4
3.75	3	5	19
6.25	5	7.5	63
9.38	7.5	10	80
12.5	10	15	36
18.75	15	20	31
25	20	25	106
31.25	25	30	176
37.5	30	40	186
50	40	50	94
62.5	50	60	320
75	60	75	120
93.75	75	100	110
125	100	125	550

Table II. Recommended Loading of Inclosed or Protected-type A.C. Motors, 50 or 55 Deg. C., Continuous or Intermittent

For Maximum Hp. Loads of	Use This Hp. Motor	Instead of This Hp. Motor	And Save These Pounds of Critical Materials
1.1	1	1.5	67
1.65	1.5	2	13
2.2	2	3	9
3.3	3	5	63
5.5	5	7.5	104
8.25	7.5	10	175
11	10	15	27
16.5	15	20	77
22	20	25	58
27.5	25	30	385
33	30	40	117
44	40	50	135
55	50	60	285
66	60	75	126
82.5	75	100	645
110	100	125	195

Table III. Recommended Loading of Open-Type D.C. Motors, 1750 R.P.M., Standard 40 Deg. C., Continuous

For Maximum Hp. Loads of	Use This Hp. Motor	Instead of This Hp. Motor	And Save These Pounds of Critical Materials
1.15	1	1.5	36
1.73	1.5	2	17
2.3	2	3	10
3.45	3	5	36
5.75	5	7	63
8.62	7.5	10	183
11.5	10	15	83
17.3	15	20	217
23	20	25	87
28.75	25	30	13
34.5	30	40	140
46	40	50	85
57.5	50	60	215
69	60	75	365
86.2	75	100	190
115	100	125	445

much as 10 percent above normal, it can be done with safety for the motor insulation. Since starting torques vary as the square of the voltage, the new starting torque will be 1.55, (1.10^2 x 1.28), and the equivalent starting torque will be 19¼ horsepower.

As a rule d.c. motors will have a wide margin of extra starting torque under maximum overloads.

Whenever possible use standard open, sleeve-bearing motors without electrical or mechanical modifications. Normally, fan-cooled motors have been used in many applications solely because they are the best lifetime motors for the purpose. In applications involving excessive dust as in foundries, or in powder mills or refineries and similar places involving explosive hazards, fan-cooled or explosion-proof motors, respectively, should continue to be used.

It will be noted by comparing Tables I and II that inclosed motors and splashproof motors have a higher temperature rise than open motors; as a result they have a smaller overload capacity. For example, open continuous-duty a.c. motors have an overload capacity of 25 percent as compared with only 10 percent for splashproof or inclosed motors.

Table IV shows the savings in critical materials that may be made by using standard open motors as compared with inclosed, fan-cooled motors.

Except in applications where thrust or vertical operation is required, open motors can usually be applied with sleeve bearings, while totally inclosed, fan-cooled motors are usually available only with ball bearings. The use of sleeve bearings wherever possible releases ball bearings for tanks, planes, and other war machines. Also, the manufacture of standard open motors takes at least 40 percent fewer machine- and man-hours than fan-cooled motors.

It is recommended that motors of the highest standard speed permitted by the application be used—the higher the speed used, the smaller the frame size.

Whenever possible avoid the use of multi-speed motors when single-speed, single-winding motors will do the job.

In applications requiring d.c. adjustable-speed motors, users often specify a wider speed range than necessary, to take care of some possible future condition. In order to keep the motor on the smallest possible frame size and save critical materials, specify the narrowest speed range that will serve satisfactorily.

Whenever possible use a.c. instead of d.c. motors. This substitution will result in a substantial saving of copper. It will also release the d.c. motor production capacity for essential military and industrial applications.

When taking advantage of the overload capacity of motors, select the control on the basis of the nameplate horsepower rating as in the past. Overload relay heaters, however, should be applied as follows:

1. For 40-deg. C. continuous-rated a.c. motors, use standard heater application tables and motor nameplate data and select the next size larger heater than listed.

Present heater application data are on the basis of tripping at approximately 115 percent to 125 percent load; therefore the use of the next larger heater will permit the motor to carry approximately 125 percent load continuously.

2. For 50- and 55-deg. C. continuous-rated a.c. or d.c. motors, use standard heater application tables and select the heater listed, instead of the next smaller one.

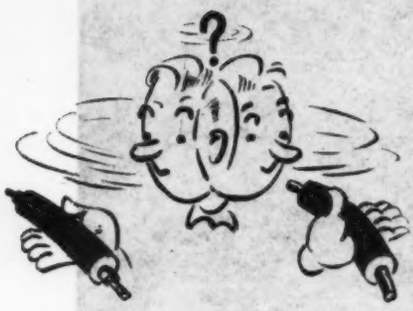
3. For 40-deg. C. continuous-rated d.c. motors select the heater listed, using standard application tables.

Table IV. Recommended Loading for Open and Totally Inclosed Fan-Cooled A.C. Motors, 1750 R.P.M.

For Maximum Hp. Loads of	Use This Hp. Rating With Open-Type A. C. Motors	Instead of This Hp. Rating With Fan Cooled A. C. Motors	And Save These Pounds of Critical Materials
1.25	1	1.5	59
1.88	1.5	2	45
2.5	2	3	35
3.75	3	5	90
6.25	5	7.5	174
9.38	7.5	10	286
12.5	10	15	233
18.75	15	20	273
25	20	25	400
31.25	25	30	581
37.5	30	40	520
50	40	50	474
62.5	50	60	660
75	60	75	465
93.75	75	100	990
125	100	125	1080

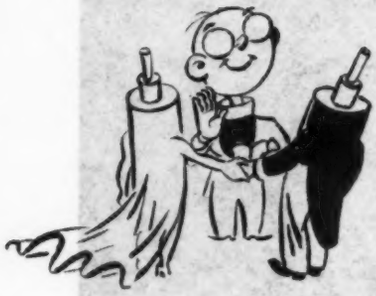
How to Get the Most Out of WIRE.. CABLE.. CORD

How to Select



1. Select Wire, Cable, and Cords Carefully

Several kinds of insulation are used on wire and cable, along with many different types of construction and protection coverings. Some types are intended for general purpose use; others are designed to meet special conditions. In general, it's good economy and sound engineering to avoid special construction where possible and pick the simplest type that meets Code requirements and service conditions.



2. Figure Closely the Carrying Capacity Needed

Copper and most insulating materials are too precious to be tied up in circuits that are appreciably larger than necessary to limit the temperature to a safe value. On the other hand, overloading of conductors causes excessive heating and voltage drop, shortens the life of insulation, and creates a fire hazard.

3. Splice and Use Short Lengths Whenever Possible

When properly joined and insulated, odds and ends of wires and cables may be used to good advantage for non-critical circuits and in temporary installations. Scarce materials will be saved and the demand lessened on manufacturing facilities.

4. Protect Stocks of Wire From Damage

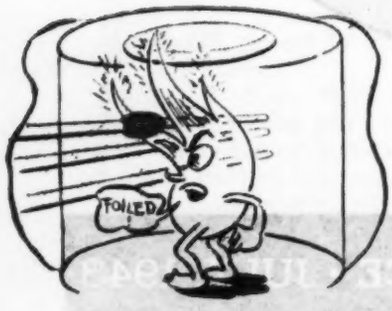
Extremes of temperature are harmful to insulating materials. So also are exposure to the weather, oil or grease, excessive moisture, corrosive fumes, sunlight.

5. Lay Out Conduit Runs of Moderate Length

Long runs may require enough force when pulling in the wires to damage them. A large number of bends, as well as sharp turns, also make it necessary to use more force than may be good for the wire.

6. Install Wires and Cables With Care

Use of excessive force when pulling into conduit or ducts, dragging wires around sharp corners or over rough edges, or unnecessarily rough handling of any kind are likely to damage insulation and coverings seriously. Grease applied to facilitate pulling into conduit is also harmful. Use talc or soapstone.



7. Splice and Insulate Conductors Properly

Regardless of how splices are made up, any time spent in doing the right kind of job is well invested. Poorly made splices will heat and lead to failure. Inadequate insulation is also likely to result in early breakdown. Weatherproof splices exposed to the elements.

8. Fireproof Cable Joints in Manholes

This precaution involves comparatively little extra work and will do much to safeguard an installation if trouble develops.

t and Install

WIRE.. CABLE.. CORD

9. Space Open Cables Closely

Close spacing reduces reactive voltage drop. On the other hand, sufficient space must be left between cables to allow adequate air circulation for cooling.

10. Provide Good Circulation of Air Around Cables

Where ambient temperatures are moderately higher than normal, air holes above the cables will help to keep them cool.

11. Use Forced Air Circulation When Temperatures Are High

If high ambient temperatures cannot be avoided, considerable cooling effect can be provided by properly located fans. Keeping cables cool increases current-carrying capacity and lengthens the life of the insulation.

12. Protect Wires and Cables Where Exposed to Injury

Suitable shields are cheap insurance against service interruptions, perhaps personal injuries, caused by mechanical damage to unprotected wiring.

13. Make Sure that Tunnels Are Well Ventilated

When cables are installed in tunnels, good circulation of air must be provided, by suitable openings or the use of fans or blowers, to avoid high ambient temperatures.

14. See That Supports for Conductors Have Adequate Strength

This precaution is particularly important with outdoor installations on which ice or sleet may collect.

15. Safeguard Wires and Cables Against Excessive Vibration

Vibration will lead eventually to mechanical damage and failure.

16. Protect Outside Installations From the Weather

As far as conditions permit, support conductors on the underside of structures, or wherever they will be shielded as much as possible.

17. Shield Rubber-Covered Conductors From the Sun

Direct sunlight hastens deterioration of rubber. Running cables up the north side of poles or other supports is a simple way to lessen or avoid exposure to the sun.

18. Apply Weatherproof Coating to Outside Cables

Coverings and saturating materials slowly deteriorate under the influence of sun, wind, and rain. A good weatherproof coating applied every year or two will preserve these materials almost indefinitely.

19. Safeguard Wiring Against Falling Liquids and Objects

Whenever possible install wires and cables where they will not be exposed to such hazards: otherwise protect them adequately.

20. Keep Circuits Properly Loaded

A load check at frequent intervals will disclose both under- and overloading and show whether loads should be added to or taken away from circuits.

21. Protect Circuits Properly Against Faults and Overloads

See that fuse ratings and circuit breaker settings are correct at the time of installation. Check them often enough to make sure that they are not changed.

22. Keep Power Factor Up

Low power factor ties up current-carrying capacity of circuits and tends to cause overheating.

23. Watch the Insulation Resistance

Once a month is not too often to check the insulation resistance of vital circuits. A steadily declining insulation resistance is a good sign that trouble is brewing.

24. Maintain Voltage Within Close Limits

When voltage drops below normal, heating increases and efficiency goes down. Keeping voltage drop to a minimum is of particular importance with circuits supplying filament lamps.

25. Guard Against Condensation in Conduit Lines

Seal or properly drain lines that must be run in places where there are excessive amounts of moisture.

26. Keep Portable Cords Free From Oil

Oil, grease, and various chemicals shorten the life of rubber. Oily materials can be removed by carbon tetrachloride, safety solvents, or soap and water. Water will take off most chemicals.

27. See That Breakers Have Adequate Interrupting Capacity

If the capacity of the power supply has been increased the old breakers may not be able to handle the maximum possible short-circuit current; hence a serious fault may have disastrous consequences.

28. Don't Install Cables or Conduits Close to Hot Surfaces

Conductors carrying rated loads develop all the heat they can dissipate under normal conditions. Exposure to external heat is likely to result in a dangerous rise in temperature.

29. Keep Ground Connections in Good Condition

To fulfill their purpose of protecting personnel and equipment, artificial grounds must have low resistance. See that connections are tight and that conductors are well guarded.

Don'ts FOR WIRE.. CABLE.. CORD

1. Don't Abuse Wires and Cables When Installing

Their coverings are tough, yes, but not so tough that they can't be cut, torn, or crushed by excessively rough handling or failure to protect them from sharp edges. Such injuries constitute weak spots that may cause trouble later on.

2. Don't Take Chances With Temporary Wiring

Slipshod workmanship or omission of any safeguard is an invitation to trouble. A few hours' time saved by cutting corners may cost plenty later on.

3. Don't Expose Rubber Insulation to Direct Sunlight

Sunlight hastens deterioration of rubber, causing it to harden and crack.

4. Don't Guess at Current-Carrying Capacity Needed

If current flow is much less than the guess, more copper than necessary will be tied up. If it is more, the result is likely to be an overloaded circuit.

5. Don't Add Load Without Checking Beforehand

Addition of appreciable load to a circuit working at or close to capacity is likely to result in overloading and serious heating. It's a good idea to check circuits after the load has been increased, just to make sure.

6. Don't Let Unauthorized Persons Replace Fuses

There's too much danger that too-large fuses will be put in. Then the circuit and the equipment it supplies will not be adequately protected.

7. Don't Permit Use of Underloaded Induction Motors

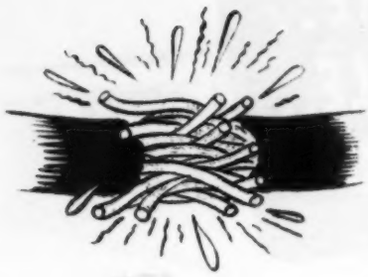
They will pull down the power factor, thereby reducing the capacity of circuits for carrying useful current, and increasing the losses.

8. Don't Expose Wiring to Mechanical Injury

Wires and cables can carry lots of power, but they have little ability to protect themselves from knocks and bumps. Any suitable method of guarding is cheap compared to the cost of a service interruption, possibly injury to personnel.

9. Don't Drag Portable Cords Over Rough Surfaces

Tears, cuts, and bruises that are certain to result will seriously shorten the life of the rubber.



10. Don't Use Defective Cords

Cords whose coverings have become broken down through use or abuse are a serious personal injury and fire hazard. Replace as soon as definite defects appear.

11. Don't Gamble on Poor Splices and Connections

Poorly made connections can, and do, make unnecessary trouble. They always heat up, and the more they heat, the worse they become. And don't forget to insulate them properly, when that is required.

12. Don't Neglect Circuit Breakers

Inspect after each opening under a heavy short circuit, and at least once or twice a year, regardless of whether they have opened under load. Examine the oil breakers every three months.

13. Don't Let Fuses and Clips Heat

When heating starts, due to resistance caused by tarnish or corrosion, it rapidly becomes worse. Service interruptions will be frequent because hot fuses will blow at current values below their rating.

14. Don't Let Portable Cords Touch Hot Surfaces

Rubber can easily be burned or scorched and made useless. Exposure even to comparatively low temperatures speeds up deterioration.

15. Don't Over-Fuse Circuits

It's the poorest possible way to keep fuses from blowing. A much better solution is to ascertain and remedy the conditions that cause the trouble.

16. Don't Let Portable Cords Be Walked On or Run Over

Walking on cords, or running trucks over them, may subject them to sufficient pressure to cut and rupture the insulation, possibly injure the conductors.

17. Don't Drag Portable Equipment by the Cord

Portable cords aren't designed to be used as tow ropes. A hard pull tends to stretch and break down the structure, reducing its life.

18. Don't Let Oil or Grease Stay on Cords

Oil poisons rubber, makes it swell and become soft. Remove oil with carbon tetrachloride or other harmless solvent.

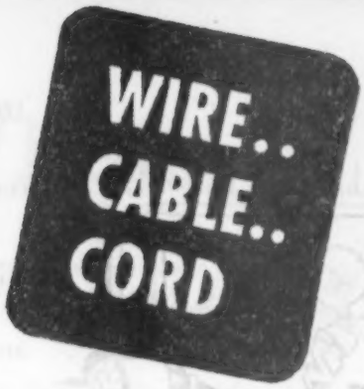
19. Don't Scrap Usable Wire and Cable

When unused circuits are torn out, inspect the insulation, cut out or reinsulate bad spots, store carefully, and re-use wherever safe to do so.

20. Don't Burn Off Insulation to Salvage the Copper

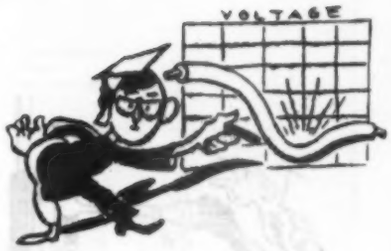
Removing insulation by burning destroys scarce rubber or synthetic materials and injures the copper. Insulation can be removed by crushing the wire between rolls, after which it can be reclaimed.

Inspecting



1. Measure Insulation Resistance

If successive tests show a decreasing value, locate and correct the weak spots.



2. Measure Voltage Drop

Excessive drop causes increased heating, more rapid deterioration, decreased efficiency.

3. Determine Power Factor

Low power factor ties up generator, transformer, and conductor capacity, and tends to cause overloading. Correct by proper loading of induction motors, by adding non-inductive loads, or by installing capacitors.

4. Examine Artificial Grounds

See that all equipment is properly grounded, and that ground resistance is low.

5. Measure Loads on Main and Branch Circuits

Compare readings with ratings of circuits to determine whether circuits are under- or overloaded.

6. Determine Rating of Overload Protective Devices

Compare with ratings of circuits to determine whether protection is adequate. Be sure that all equipment and circuits are protected in accordance with Code rules.

7. See If Breakers Have Adequate Interrupting Capacity

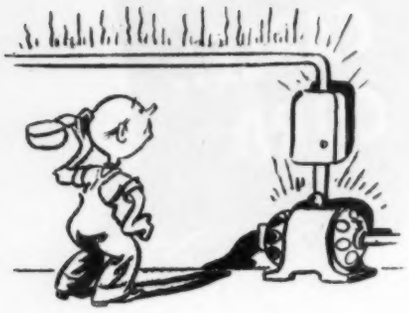
Assuring proper selection of circuit breakers originally, their interrupting capacity usually needs to be considered only when the capacity of the supply has been increased.

8. See Whether Any Wiring Is Exposed to Severe Conditions

These conditions include heat, sunlight (with rubber insulation), excessive moisture, corrosive fumes. Correct conditions if possible. If not, make sure that wiring is suitable, or adequately protected.

9. Determine Amount and Condition of Temporary Wiring

Remove or install permanently as much as possible. Correct unsafe conditions in all temporary work that is still needed.



10. Determine Need for Better Mechanical Protection

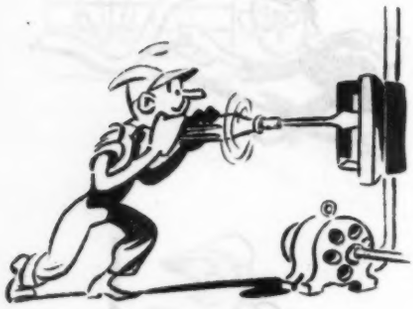
Wiring that is exposed to mechanical injury is a hazard to personnel and to continuity of production.

11. Examine Circuits and Equipment for Abnormal Heating

Heating may arise from various causes—overloads, low power factor, high-resistance connections, high ambient temperatures. Determine the cause, and correct.

12. Inspect Fuses and Holders for Condition

High-resistance contacts between fuses and their clips or jaws will cause serious heating and needless blowing of fuses.



13. See That Loads Are Evenly Balanced

This precaution applies to three-wire direct-current, and three-wire single and polyphase alternating-current systems.

14. Inspect All Switches for Condition

See that jaws and blades are smooth, clean, in alignment. Tighten connections.

15. Inspect Circuit Breakers for Condition

Examine contacts, connections, all working parts. Test the oil and filter or replace if necessary.

16. Inspect all Connections

Bolts, screws, and clamps tend to loosen up, resulting in high-resistance contacts and heating which rapidly grows worse. Improperly soldered lugs also cause trouble. Clean contact surfaces and tighten bolts, or resolder.

17. Look Into Condition of All Portable Cords

Examine for cuts, tears, cracking of covering. Replace at once if defective.

18. Inspect Manholes and Ducts of Underground Systems

See that manholes are accessible, covers in good condition, and ducts properly drained.

19. Examine Condition of Insulators and Supports

See whether any parts need replacing, tightening, strengthening.

20. See Whether Portable Cords Are Longer Than Needed

Use of longer cords than necessary is wasteful of scarce materials. If excessively long cords are required, consider the advisability of installing additional outlets.

21. Watch for Abuse of Portable Cords

Warn operators against such practices as dragging portable cords over rough surfaces or sharp edges, pulling heavily on them, allowing them to be walked on or run over or to be covered with oil or grease.

How to Play Safe When Overloading Transformers

W. C. SEALEY, Engineer in Charge of Transformer Design, Allis-Chalmers Manufacturing Company, Milwaukee

UNDER PROPER CONDITIONS a transformer can safely carry loads considerably in excess of its nameplate rating. Familiarity with these conditions is the first step toward overloading transformers with safety, since a transformer may suffer serious damage from unsafe overloads.

The oil in an oil-immersed transformer serves as insulation and to carry heat away from the core and coils. Circulation in a typical transformer is shown in Figure 1. Heat produced by current flowing in the winding (due to the resistance of the winding) is transferred to the adjacent oil, causing its temperature to increase. The oil flows as shown by the arrows from the coils to the radiators where the heat is transferred to the surrounding air.

Temperature of the copper at every point is higher than the temperature of the adjacent oil. For example, in the sketch, the copper temperature at *A* is higher than the adjacent oil at *A'*. This temperature difference is sometimes called the copper gradient. With uniform oil flow the gradient between the copper and the adjacent oil is constant throughout the transformer, but the copper temperature varies.

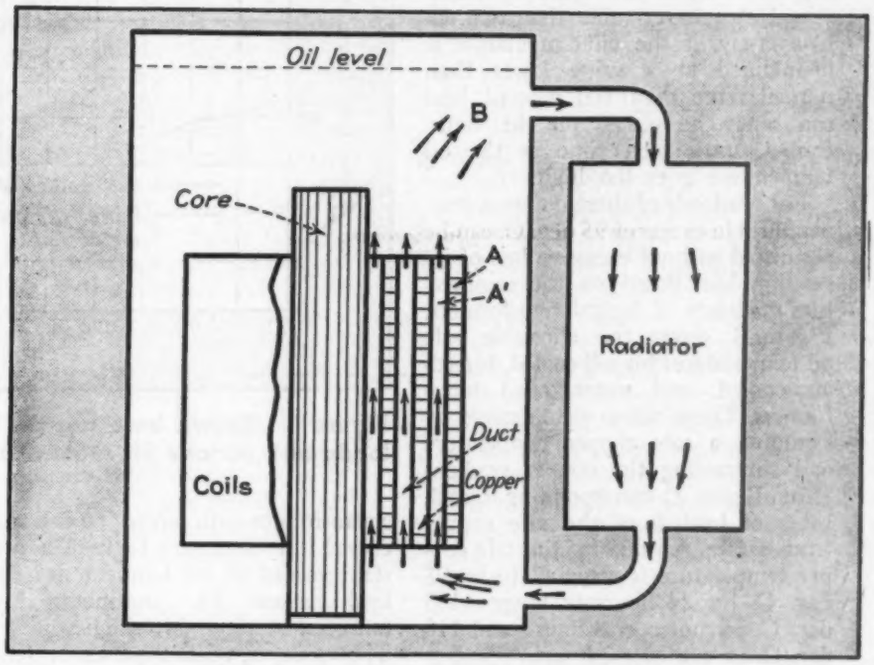


Figure 1. In an oil-cooled transformer the oil follows the path indicated by arrows, up through the coils, down through the radiator

Oil Absorbs Heat

The oil increases in temperature as it absorbs heat from the coils and rises through the coil ducts, reaching its highest temperature near the top of the coil. The hottest copper is, therefore, very close to the top of the coil.

Heat has the effect of aging insulation, causing its mechanical strength to decrease. The rate of aging doubles for approximately each 8 deg. C. increase in temperature. Insulation of the hottest conductor tends to lose its mechanical strength, or age, at a faster rate than insulation at any other point. For continuous operation with reasonable length of life of insulation, hot-spot temperatures should remain below 95 deg. C. Therefore safe operation of transformer windings requires that the temperature remain below 95 deg. C. most of the time, along with the re-

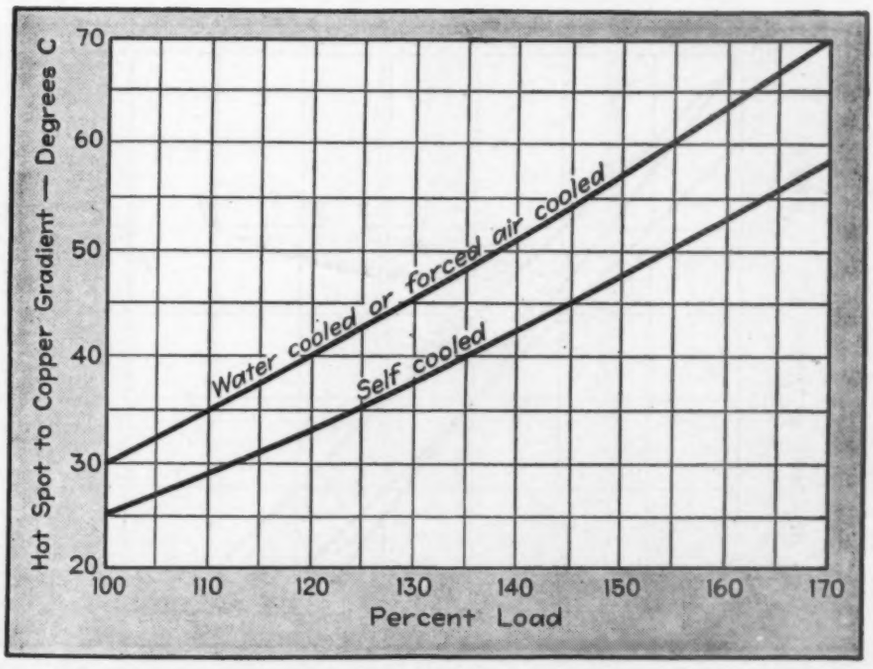


Figure 2. The temperature gradient of the transformer copper increases with load as shown by these curves for typical designs

quirement that the loss of life be small during the time when this temperature is exceeded. With higher temperatures, the time is shorter for a given loss of life.

The temperature difference between the transformer copper and the oil increases approximately as the 1.6 power of the load, as shown in Figure 2. If the hot-spot copper temperature is to be maintained constant at 95 deg. C. and the load on a transformer is to be increased above 100 percent of its nameplate rating, it is obvious that the oil temperature must be maintained at a lower value than normal. Conversely, if the oil temperature is maintained at a value lower than normal more than 100 percent load can safely be placed on the transformer, until such time as the oil temperature goes too high.

For overloads of short duration temperatures in excess of 95 deg. C. can be permitted without excessive loss of insulation life. Based on the temperature gradients of typical transformers, Figure 3 shows the allowable safe oil temperatures for self-cooled, forced-air cooled, and water-cooled transformers. These curves were derived by assuming a safe copper temperature and subtracting the copper gradient (from Figure 2) corresponding to each value of load from the safe copper temperature. A value for the safe copper temperature is assumed to be 95 deg. C. for 24 hours or longer; 105 deg. C. for not over 8 hours; and 110 deg. C. for not over 2 hours.

Loading in accordance with Figure 3 makes one method of overloading a transformer with safety. To use such curves it is necessary to keep a constant record of oil temperatures and load current. The continuous load must not be allowed to rise beyond the 24-hour curve, while the load for 8 and 2 hours must not be allowed to rise beyond the corresponding curves. If the temperature of a transformer tends to exceed the curves, either the load must be cut down or the oil temperature must be reduced by one of the methods to be described later.

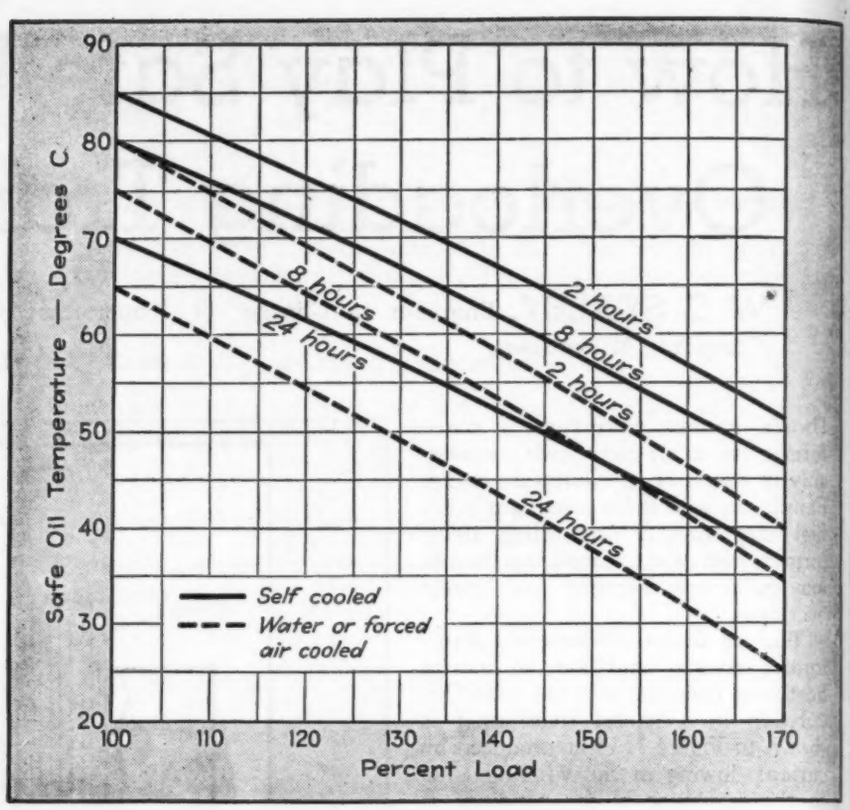


Figure 3. Shown here are the safe oil temperatures under different loads and periods for water, forced-air, and self-cooled transformers

Water-spray cooling of transformers is not usually considered to be a satisfactory method for continuous operation, but for short periods and at infrequent intervals it provides a relatively easy means of reducing oil temperature. Where transformer temperatures can be read hourly and the current in the winding can be checked at hourly intervals or oftener, depending on the type of load, the curves in Figure 3 provide an effective means of loading transformers safely without using the additional approximations required for overloading by one of the other methods.

The oil temperature of a transformer changes slowly because of the thermal capacity of the transformer, while the copper-over-oil gradient changes fairly rapidly. Curves of Figure 3 allow good advantage to be taken of the thermal capacity of the oil by direct observation. This practice eliminates complicated calculations and the approximations necessary in making them. It provides an automatic correction for ambient temperature and load factor, together with correction for any kind of supplemental cooling that may be used.

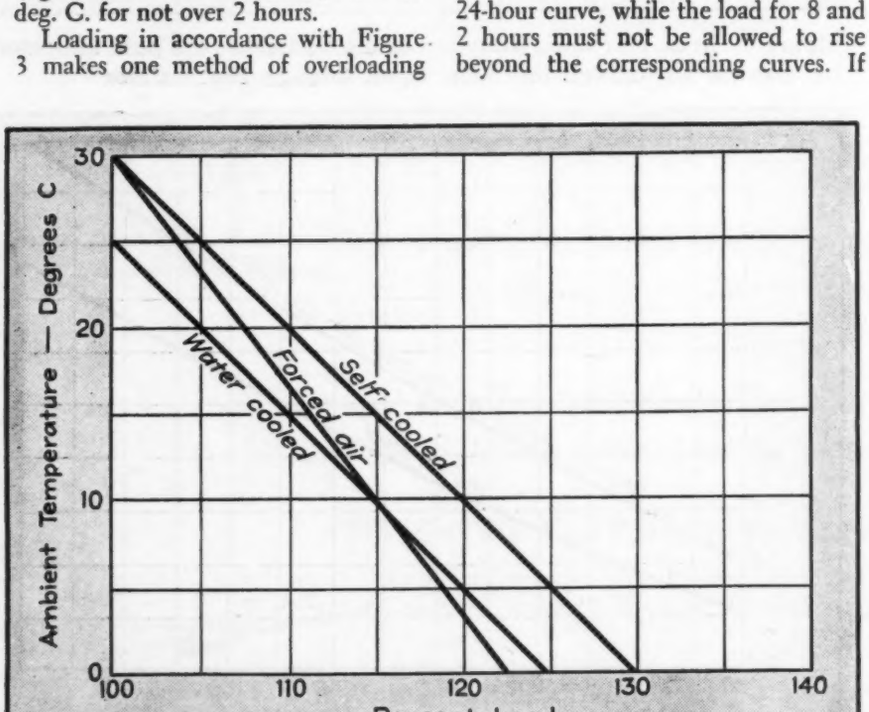


Figure 4. When ambient temperatures are below normal, safe loadings for water, forced-air, and self-cooled transformers are as shown

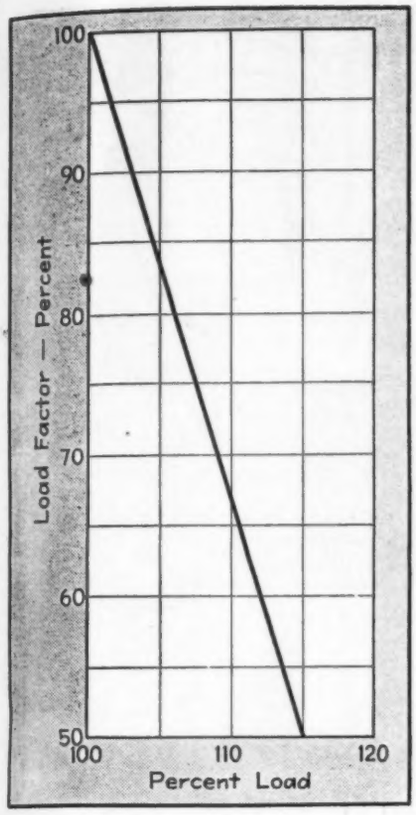


Figure 5. As the load factor goes down, the permissible overload on a transformer increases

On the other hand it has the disadvantages of requiring constant attendance and of not lending itself so readily to predetermination of the safe loads on a transformer. This method may be used, however, as a check on calculations when an estimate has been made by other means.

A safe load for a transformer is a load that can be carried without excessive loss of life. Advantage ought to be taken of any circumstance that permits an overload to be carried without excessive loss of life, during wartime conditions and, at least to some extent, even in normal times.

The factors that permit safe overloading may be divided into two classes: (1) Those that provide for the overload by means of oil temperature reduced below normal. (The normal oil temperature for self-cooled transformers is assumed to be the temperature at continuous full-load operation with an ambient of 30 deg. C.); (2) factors that result in less than normal life of the insulation of the transformer, but still a permissible loss of life. Factors of the latter class are associated with short-time overloads.

The following factors of the first class are means for obtaining a lower oil temperature so that an overload can be carried safely:

1. Ambient temperature below 30 deg. C.

2. A load factor of less than 100 percent.

3. Increased cooling provided by supplemental means.

The Class 2 factor that permits higher overloads with increased rate of loss of life of insulation is a sufficiently short duration of the higher temperatures so that the loss of insulation life is permissible.

When the ambient temperature is less than 30 deg. C., the oil temperature will be cooler than normal; consequently additional load can be carried because a higher gradient is permissible, as Figure 3 shows.

The safe, continuous kva. loading for ambient temperatures below normal for self-cooled, forced-air cooled, and water-cooled transformers is shown by the curves in Figure 4. The following rules are sometimes used instead of these curves: "The continuous kva. loading for transformers may be increased 1 percent for each degree that the equivalent ambient temperature is below 30 deg. C. for self-cooled transformers; ¾ percent for each degree below 30 deg. C. for forced-air cooled transformers; 1 percent for each degree below 25 deg. C. for water-cooled transformers."

For periods of one day or less the equivalent ambient temperature may be assumed to be equal to the average ambient temperature. For longer periods the equivalent ambient temperature may be taken from the table on page 149.

Very few transformers operate at constant load continuously. The daily load factor is equal to the average kva. load over a period of 24 hours divided by the peak kva. load during this time.

If the peak load on a transformer is equal to the nameplate rating, the oil temperature will be lower than normal because the transformer is not generating the normal quantity of heat all the time.

Overloads that can be carried due to daily load factors below 100 percent are shown in Figure 5. The relation shown in Figure 5 is sometimes stated: "The load on a transformer may be increased 0.3 percent for each percent that the load factor is below 100 percent, but the total increase for this factor should not exceed 15 percent."

The thermal capacity of a transformer has the effect of smoothing out this variation in heating, since a considerable length of time is required to heat the oil. Consequently, the oil temperature will be lower than normal and a load in excess of 100 percent of normal can be carried.

A lower oil temperature can be maintained by increasing the cooling of the transformer by some supplemental means such as blowing air on the radiators, spraying water on them, or by a combination of circulating the oil and the air. These devices all perform the same function—namely, that of decreasing the oil temperature so that a higher current can be carried in the windings.

A typical application of fans for

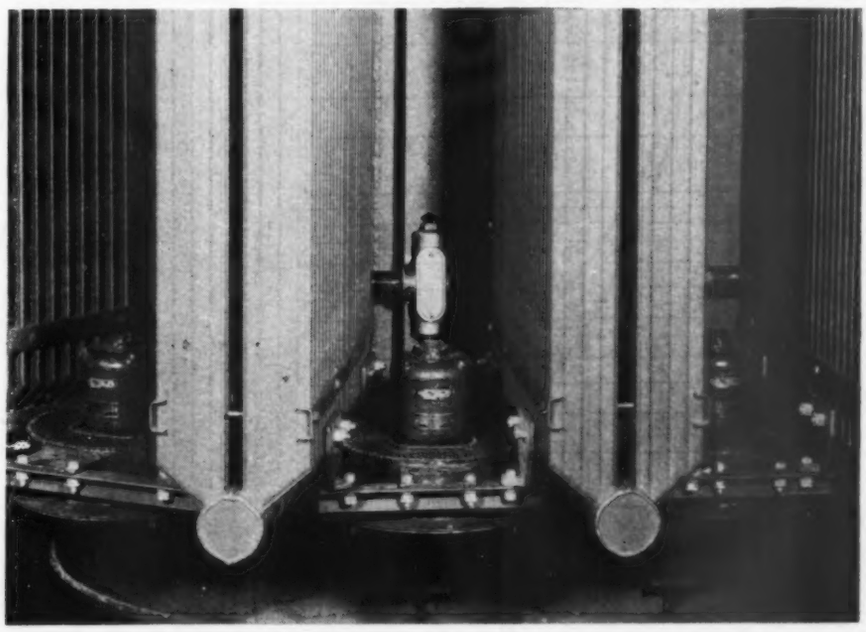


Figure 6. Here is a typical arrangement of fans on an oval tank for the forced-air cooling of a large power transformer

cooling transformers is shown in Figure 6. The increase in rating due to forced-air cooling is often 25 percent, sometimes as high as 33 percent for large transformers. Forced air increases heat dissipation from a plain tank only slightly, but it can greatly increase the heat dissipation from radiator tubes or flutes. Consequently, it is most effective on units with a large number of radiators. Fans may be applied to both new transformers and those now in service.

If the cooling surfaces of a transformer are kept wet with a water spray, the heat dissipating capacities are increased. The actual amount of the increase depends upon the temperature and humidity of the air as well as on the water temperature. The quantity of water required is usually less than ½ gallon per minute for each kilowatt of loss dissipated.

Water-spray cooling equipment may be as simple or as elaborate as desired. To be effective, water spraying should keep all cooling surfaces of the transformer wet and, in addition, provide water spray for the air that comes in contact with the cooling surfaces. Any form of water spray, from a temporary hose to a permanent installation of spray nozzles, will help to keep the oil temperature to a low value.

The amount of increase in load possible by water-spray cooling depends upon the radiation surface of the transformer, the design of the transformer, and the other factors previously mentioned. Usually the increase ranges from 25 to 60 percent.

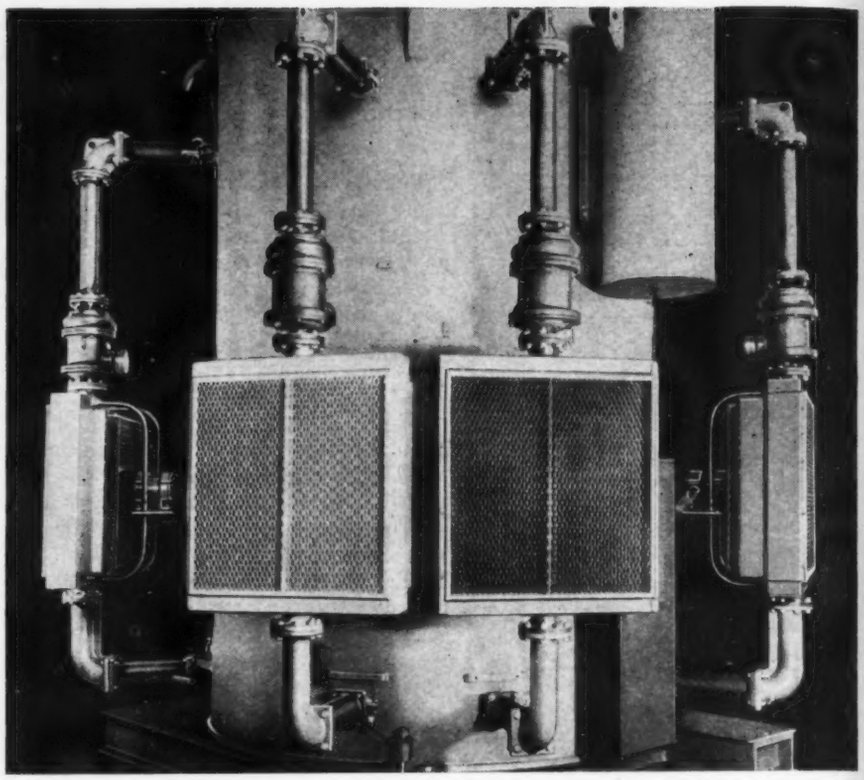


Figure 7. Forced-oil cooling is used for this 40,000-kva. transformer. The oil pumps and heat exchangers are supported by the oil piping

The curves in Figure 3 are of much value in checking the amount of increased capacity possible to obtain by using water-spray cooling.

Forced-oil cooling is the most effective means of supplemental cooling because it combines forced air or water circulation with forced circulation of the oil. A pump is used to circulate the transformer oil through an oil-to-air heat exchanger in most instances, or sometimes an oil-to-water heat exchanger. The air is moved through the heat exchanger by a fan. In the system of forced-oil cooling shown in Figure 7, the pump and heat exchanger are supported by the piping through which

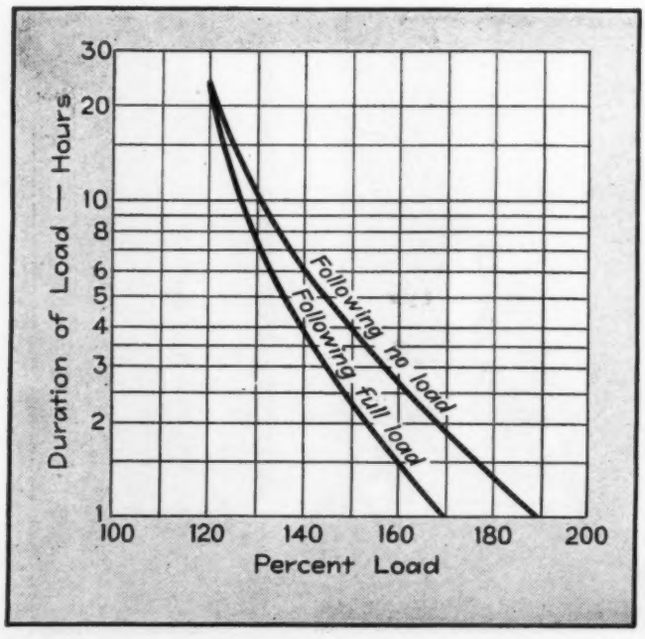


Figure 8. Permissible short-time emergency loads for transformers rated 500 kva. and below

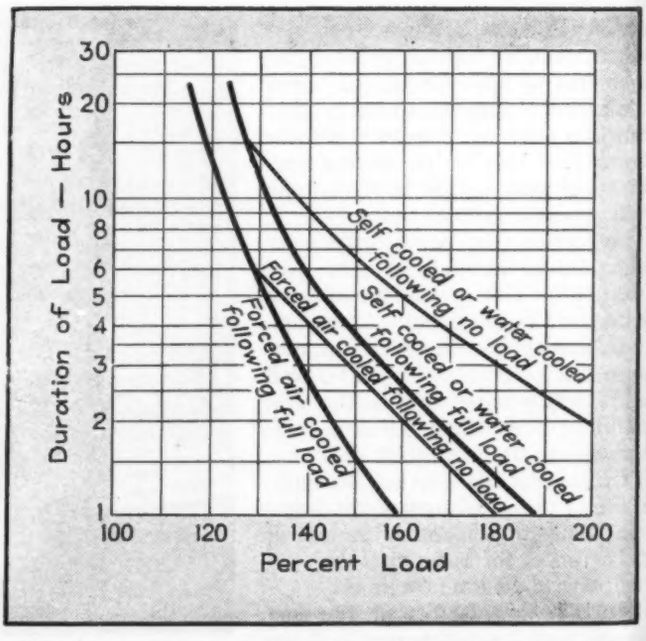


Figure 9. Transformers that are rated above 500 kva. can be asked to carry these emergency loads

the oil flows, eliminating the necessity of flexible connections and auxiliary supports. The pump motor is immersed in the circulating oil. Oil is drawn from near the top of the transformer tank, flowing downward through the pump, forced through the heat exchanger, and returned to the tank near the bottom, where it can flow upward through the coils.

In many instances the capacity obtainable with forced-oil cooling is 167 percent of full load.

Forced-oil cooling may be applied both to new transformers and to transformers now in service that were built for self cooling or water cooling.

When two or more factors in Class 1 that would permit higher overloads exist at the same time, the total safe overload can be obtained by combining the increased amount of load permitted by each of the various factors singly. For example:

A 5000-kva., 55-deg. C. rise, self-cooled transformer is operating with a daily load factor of 70 percent, the load being substantially constant during the year. It is located in Philadelphia. What is the safe peak load for this transformer?

From Figure 5, the safe load for 80 percent load factor is 106 percent. The table below shows that the annual equivalent ambient temperature for Philadelphia is 22 deg. C. From Figure 4, the safe load for 22 deg. C. equivalent ambient is 108 percent. Therefore the excess safe load over 100 percent is $6 + 8 = 14$ percent. Under these conditions the transformer can safely carry a peak load of 114 percent of 5000 kva., or 5700 kva.

Increasing the rating of transformers without keeping the oil temperature low means sacrifice of part of the transformer life. This method is most applicable to short-time, emergency overloads. An emergency overload is one that occurs very infrequently—on the order of once a year.

Emergency Overloads

Figures 8 and 9 show permissible short-time emergency overloads for power and distribution transformers following no load with excitation and following full load continuously. Interpolation may be used for values following partial loads. When the winding current is exceptionally heavy, special consideration is required.

Before transformers are overloaded examine them to make sure that they are in first-class condition and that the insulation, windings, and oil are reasonably clean and free from excessive amounts of moisture and sludge. The limiting factor in overloading transformers may not be the winding. It may be oil expansion, pressure in sealed-type units, bushing leakage at soldered connections, tap changers, ammeter scales, or the thermal capacity of associated equipment such as cables, reactors, circuit breakers, disconnecting switches, and current transformers. These elements may determine the practical limit in load-carrying ability. Before heavily overloading a transformer, it is recommended that the manufacturer be consulted.

Where it is possible to do so, it is good practice to conduct overload tests on transformers that are to be overloaded, so that any limiting factors may be discovered and changes made if they are required.

The means to be used in any particular case for carrying overloads on transformers with safety depend upon existing conditions and the requirements that have to be met.

Safe Annual and Monthly Equivalent Ambient Temperatures, Degrees Centrigrade

	Annual	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Atlanta	25	16	17	20	23	27	30	30	30	31	25	20	18
Bismarck	21	3	8	14	17	23	27	32	28	25	19	11	7
Boston	20	8	7	11	15	22	27	28	26	24	20	13	11
Chattanooga	24	16	17	20	22	26	30	30	30	28	25	20	15
Chicago	21	10	10	13	18	23	28	28	27	25	19	14	11
Corpus Christi	28	22	22	25	27	28	30	31	31	30	29	25	24
Dallas	28	25	20	23	26	28	32	33	33	31	26	21	18
Denver	23	12	13	15	19	23	27	30	31	26	20	15	14
Detroit	20	6	8	11	17	23	27	28	27	25	18	13	8
El Paso	26	15	15	20	24	28	32	32	31	30	25	20	16
Helena	20	10	8	11	16	20	25	29	27	22	17	11	10
Kansas City	25	11	13	20	21	26	32	33	33	28	22	18	13
Los Angeles	24	20	20	22	22	23	25	27	27	27	25	22	20
Louisville	24	16	13	18	22	26	28	31	30	29	22	20	17
Miami	28	27	25	26	28	28	29	30	30	29	28	27	27
Milwaukee	20	6	6	10	16	21	27	28	26	23	18	13	7
Minneapolis	21	2	3	12	18	24	28	30	29	24	18	9	6
New Orleans	27	23	23	24	25	28	31	31	31	30	29	23	22
New York	21	11	9	14	18	23	28	29	27	26	20	14	11
Oklahoma City	25	17	19	21	23	26	32	32	33	31	26	20	13
Philadelphia	22	12	10	16	19	23	28	29	28	27	20	15	11
Phoenix	31	18	20	23	28	32	36	39	38	35	30	22	18
Pittsburgh	23	12	12	15	20	25	27	30	29	28	21	17	12
St. Louis	25	14	13	20	22	26	32	33	32	27	22	20	15
Salt Lake City	22	6	9	13	18	24	29	32	31	26	19	11	8
San Francisco	19	14	15	18	19	20	21	20	20	22	20	18	14
Seattle	18	10	11	16	17	20	21	23	22	20	17	12	10
Washington, D. C.	23	12	12	18	21	26	28	31	30	28	21	16	12

Mobilizing to Fight Flood

HOW AN ENTIRE FACTORY organization can be mobilized in extreme emergency is illustrated in Caterpillar Tractor Company's fight against the menace of flood.

It all happened when the ordinarily peaceful Illinois went on the rampage late in May. Production was stopped for more than a week while everyone in the plant joined up to whip the river.

A 99-year record was broken, but creek and river levees around the plant held after a hard, gruelling fight. Had they broken, the entire plant would have been flooded, to a depth of several feet at some points, and much of the city of East Peoria would have been under water.

At the peak of the fight two 12-hour shifts of 6500 employees each were at work bolstering the levees with sandbags, plugging seep holes, manning heavy earth-moving equipment to cut roads, build dams, and carry material through gumbo that defied all other modes of transportation. Other men took precautionary methods inside the plant; still others put up a wall of sandbags in front of more than 300 openings in the plant in case the levees broke.

More than 1,500,000 sandbags were used. An SOS brought sacks of all kinds from all points—seed sacks, cement sacks, sugar sacks, fertilizer sacks. These were filled with black molder's sand from fills back of the foundry and with sand brought in by railroad and barge. In addition, 800 cars of sand were used in bulk along railroad tracks on a part of the levee.

Caterpillar has over 2000 men trained in first aid and safety practices. When the emergency arose, first aid stations were set up, tents were pitched, and nurses went on duty aided by these trained men. Ambulances, stretchers, and medicines were on hand. Sore throats, colds, strained backs, and twisted ankles were promptly taken care of. When a heavy rain fell, 3000 yards of oil cloth were made up into makeshift cloaks to protect the men.

The cafeteria force worked day and night to get food to the men. The hungry workers devoured 154,000 sandwiches, 102,000 cups of coffee, 101,000 cups of soup, and 6900 candy bars. To round out the diet, over 50,000 vitamin pills were served. "Smokes" consumed 5200 packs of cigarettes.

Tractors, loaded with sandbags, roll out in formation toward the levee where Illinois floodwaters are raging. The plant, sandbagged to protect vital war production, is safe if the levees should break

Office work comes to a standstill as employees take precautions against the flood menace. Typewriters and files are "high and dry"

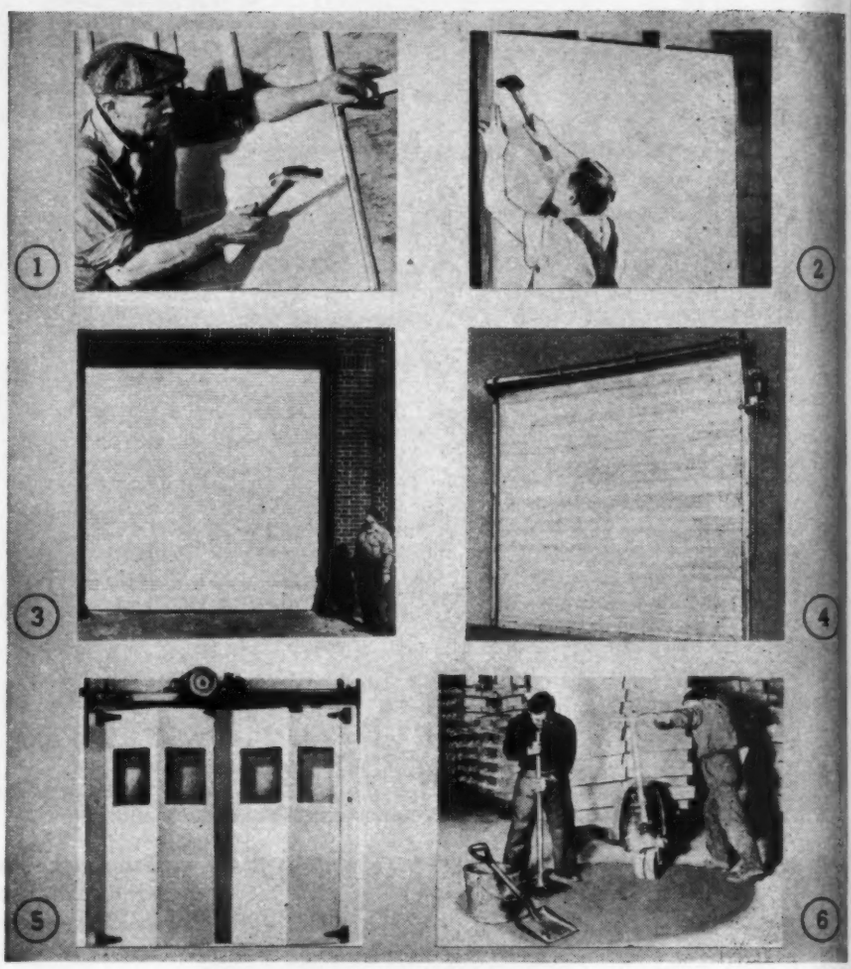
Sandwich assembly-line rushes man-sized ham sandwiches to the flood fighting front. Cafeteria employees worked 12-hour shifts to feed the men. Safety employees toted food night and day

In a first aid tent (above) a nurse attends to an injured worker. Four such stations were set up

Left, more than 1,500,000 sandbags were laid. Bucket brigades rushed the 75-lb. bags up front

Building Materials

Building materials introduced to you by *Factory* during the past 12 months are reviewed here to give you a quick one-year summary



BOARD PANEL—known as Chevron board is smooth plastic-coated wallboard that requires no on-the-site finishing. Will not warp, chip, craze, crack, or peel. Quickly and easily installed by nailing, screening or cementing to old walls on new framing. Barclay Manufacturing Company, New York. (Figure 1)

BUILDING BOARD—of asbestos-cement, called Stonewall, can be used for interior and exterior sheathing, sheds and warehouses, partitions, linings. Made in $\frac{1}{16}$-, $\frac{1}{4}$-, and $\frac{3}{8}$-in. thicknesses. Flexible, easy to saw, score, drill, and nail. Fireproof, rotproof, verminproof. Needs no paint. Ruberoid Company, New York. (Figure 2)

BOARD—of gypsum builds, sheathes, sides, braces, and decorates in one operation. Fireproof and weatherproof. Drip-cap shiplap edge protects joints between boards from the weather. Camouflage-green exterior and manila inner surface. United States Gypsum Company, Chicago.

CLEANING COMPOUND—trademarked Oakite Compound 84 removes scale, rust, insoluble soap deposits, stains, discolorations from windows, filter cloths, painted surfaces, galvanized water coolers, enameled surfaces. Oakite Products, Inc., New York.

DOOR—upward acting, rolling door composed of wood slats shaped to permit easy articulation, joined together by metal tapes and cables. Coils overhead upon a barrel; travels in wood guide. Operated manually, by chain and reduction gearing, or by motor. The Kinnear Manufacturing Company, Columbus, Ohio. (Figure 3)

DOOR—wood door made of slats formed to roll on each other and to coil overhead. Connected with steel inner bands from top to bottom. Wood guides and plywood overhead covering hoods can be arranged so that steel curtains can be substituted later. Cornell Iron Works, Inc., Long Island City. (Figure 4)

DOOR UNIT—comes packed in three sections, is easy to install. Headpiece carries all operating mechanisms and wiring; each side jamb has the operating leaves attached, and the jamb is tenoned to fit into the mortise of the headpiece. When in the open position, doors fold behind the opening. Doors lock automatically when closed. Clark Door Company, Inc., Newark, N. J. (Figure 5)

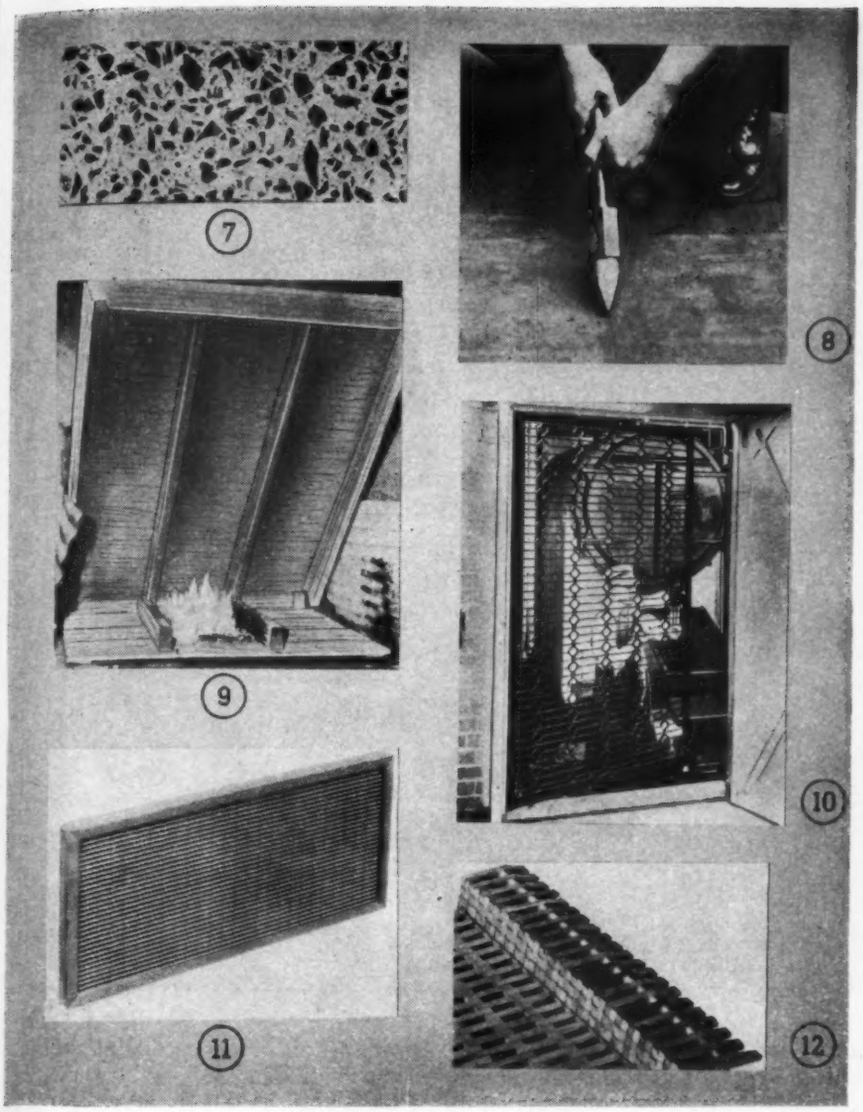
FLOOR COMPOSITION — mastic floor composition blends into a closely knit tile structure. Features cohesive strength, tight texture, repellance to water and acids, good resistance to point loads. Bonds tightly to all types of floors. No chipping or cutting of old floors is required. Flash-Stone Company, Inc., Philadelphia.

FLOOR COVERING—non-skid covering that can be applied to steel or wood with a brush or trowel. Durable and waterproof. Gives a ready bond, needs no elaborate preparation. Black, red, blue, and gray. Armstrong Cork Company, Lancaster, Pa.

FLOOR PATCH—ready mixed floor patch, called Instantuse, repairs ruts and holes in industrial floors. Placed in a swept and primed hole and tamped, the place can be used immediately. Holds in concrete without chipping or breaking up old surfaces. Compacts under traffic. Flexrock Company, Philadelphia. (Figure 6)

FLOOR PATCH—is ready to use on any surface. Old concrete does not have to be chipped or torn up. Self-healing; will withstand heavy traffic. Known as Hercules Speedy patch. Evercrete Corporation, New York.

FLOORING—non-skid floors, wet or dry, provided by Cortland Emery Ag-



gregate; a mixture of scientifically graded large and small, sharp, hard particles of mineral emery. Increases load bearing qualities. Heavy trucks will not destroy surface. Walter Maguire Company, New York. (Figure 7)

FLOORING — ready-mixed mastic flooring material, known as Condurock, shows resistance as low as 700 ohms through a 5-lb. electrode with 5 square inches of contact area and floor not entirely free from dirt. Sparkproof and will carry heavy loads. Can be used for traffic areas, table and work bench surfaces. Rock-Tred Corporation, Chicago.

FLOORING—of asphalt tile provides a surface condition that results in less than 0.1 megohm resistance to static electricity under certain specific conditions. No open flame required during installation—an electric soldering iron does good job; suitable as resilient flooring in locations where static electricity presents a safety hazard. Armstrong Cork Company, Lancaster, Pa. (Figure 8)

FLOOR TREATMENT UNIT — trade-marked Color-Flex-Plus, consists of cleaner and dye-like coloring. Does a fast and lasting job of conditioning floors by removing dirt, grease and grime. Color withstands continuous heavy traffic. Eliminates sanding, dusting, powdering of concrete, splintering, cracking, scouring of wood. Four colors—red, green, gray, brown. Flexrock Company, Philadelphia.

FINISH—that gives new bricks a weathered appearance, makes additions or alterations to an old structure, dyed by soot, smoke, or factory dust, blend with their surroundings. Known as Justrite Brick-Aging Finish, it can be applied to a few bricks or a whole building. Louis Melind Company, Chicago.

FIRE RETARDANT—named Firepel is an aqueous solution applied by brush or spray on unfinished surfaces. Is not rapidly destroyed by combustion. Lasts indefinitely when not exposed to the weather. Albi Chemical Corporation, New York. (Figure 9)

GRILLE — for doorways barricades against intruders without obstructing air, light, or vision. Steel links and ⅝-in. steel rounds afford neat appearance as well as strength. Permanently installed by massive steel hinges. Apertures prevent admittance of a man's hand. The Kinnear Manufacturing Company, Columbus. (Figure 10)

GRILLE—for ventilating openings in doors, walls, panels, baseboards, meets the demand for a ventilator unit that cannot be seen through from any angle. Can be used for exterior fresh-air intake, because it provides a barrier to rain or snow. Barber-Colman Company, Rockford, Ill. (Figure 11)

MATTING — constructed of wood links, is light in weight and can be rolled or folded for easy handling and cleaning. Lying flat, it follows the contour of the floor and allows good drainage. Ends are beveled to reduce danger of tripping. Usable on oily and greasy floors and around machinery. American Mat Corporation, Toledo. (Figure 12)

PAINTS — and enamels, known as War-Formula, may be brushed or sprayed on, cover old or new surfaces of wood, brick, metal, plaster. Variety of colors, commercial interior gloss, semi-gloss, flat paint available. S. C. Johnson & Son, Inc., Racine, Wis.

PAINT—product trademarked Valdura Singlekote, primes, seals, and finishes any interior surface in one coat. Can be applied to plaster, concrete, brick, wallboard, wood, wallpaper, and metal surfaces. Sets within two hours, dries in 12 hours. Provides a dead-flat finish. American-Marietta Company, Chicago.

PAINT—of liquid plastic, for interiors, exteriors, and concrete floors, expands and contracts with changing temperatures. Cracks, splits, and joints of reasonable size remain sealed by plastic bond. Surface is non-porous and impervious to dust and moisture. Applied by brush or spray. Calumet Plastic Company, Hammond, Ind.

PAINT—called O'Lite is a resin-emulsion paint that can be used on almost any kind of interior surface. In paste form, light colors and white, needs no primer or sealer. Applied by brush or spray over new or old painted plaster,

wood, brick, cement, wallpaper, concrete, acoustical board, metal. O'Brien Varnish Company, South Bend, Ind.

PAINT—flat wall water paint, trademarked, Techide, can be applied with a calcimine brush on plaster, wallboard, old painted surfaces, cement, brick, and casein-painted surfaces. Dries in one hour, permits second coat in three hours. Washable. Available in ivory, gray, white, and pastel colors. Pittsburgh Plate Glass Company, Pittsburgh.

PAINT—specially formulated for zoning marks in factories and parking lots. One coat of Porcelite, which can be applied by brush or spray, makes a clean, permanent, scuff-proof line on all types of exterior or interior surfaces. Thomson-Porcelite Paint Company, Philadelphia. (Figure 13)

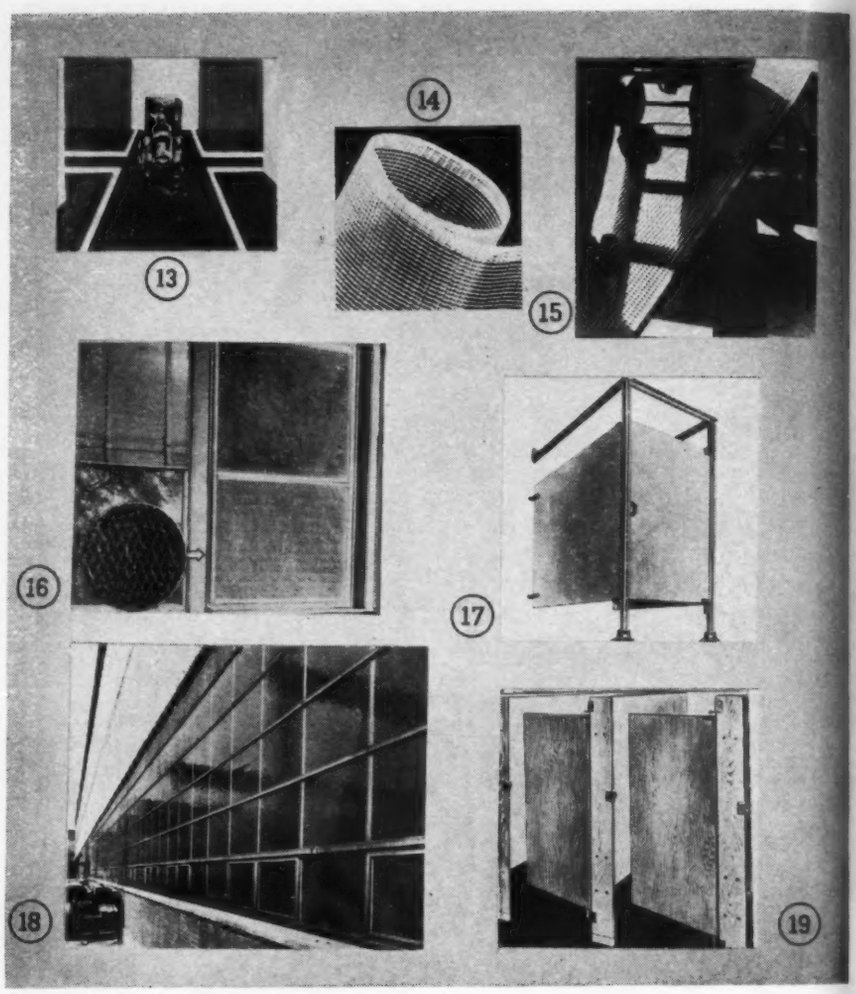
PAINT—in eight pastel shades and white applies easily and is washable. Known as Opaltone, it covers wallboard, concrete block, brick, plaster, wallpaper, and painted surfaces, usually with only one coat. Truscon Laboratories, Detroit.

SAFETY CLOTH—A tough cotton mesh whose openings are filled with plastic, will not shatter. Can be used alone, instead of window glass, or applied inside over regular window glass to minimize the shattering effect of nearby explosions. Admits light, resists weather, easy to install. Colloid Equipment Company, New York. (Figure 14)

SAFETY MAT—made of scrap rubber composition links held in place by wire rods, is for use in entrances, aisles, in front of machines where there is not an excessive amount of oil. Known as Tuf-Link. Industrial Products Company, Philadelphia.

SAFETY RAMP—provides non-slip security for men and machines. Steel safety plate can be supported in the center or stiffened with turned down edges to make self-supporting portable or stationary ramp to bridge pits, holes, rough spots. Sharp edges of perforated holes punched through the tops of raised buttons give gripping action. Liquids drop through the holes, making ramp practically self-draining. Morton Manufacturing Company, Chicago. (Figure 15)

SCREEN—is a porous blanket made of 16 layers of black and 4 layers of light-colored flameproof expanded fiber, for blackout and shatterproofing. Mounted on a light wooden frame and attached inside windows, skylights, and door glass. Permits air to pass, but prevents broken glass. Research Products Corporation, Madison, Wis. (Figure 16)



SEALING COAT—known as Carbo Seal, seals asphalt or bituminous coatings used for waterproofing. Prevents asphalt bleaching through light-colored coatings. No fire hazard. Can be sprayed on roofs or hot areas adjacent to blast furnaces and similar units with complete safety. Carbozite Corporation, Pittsburgh.

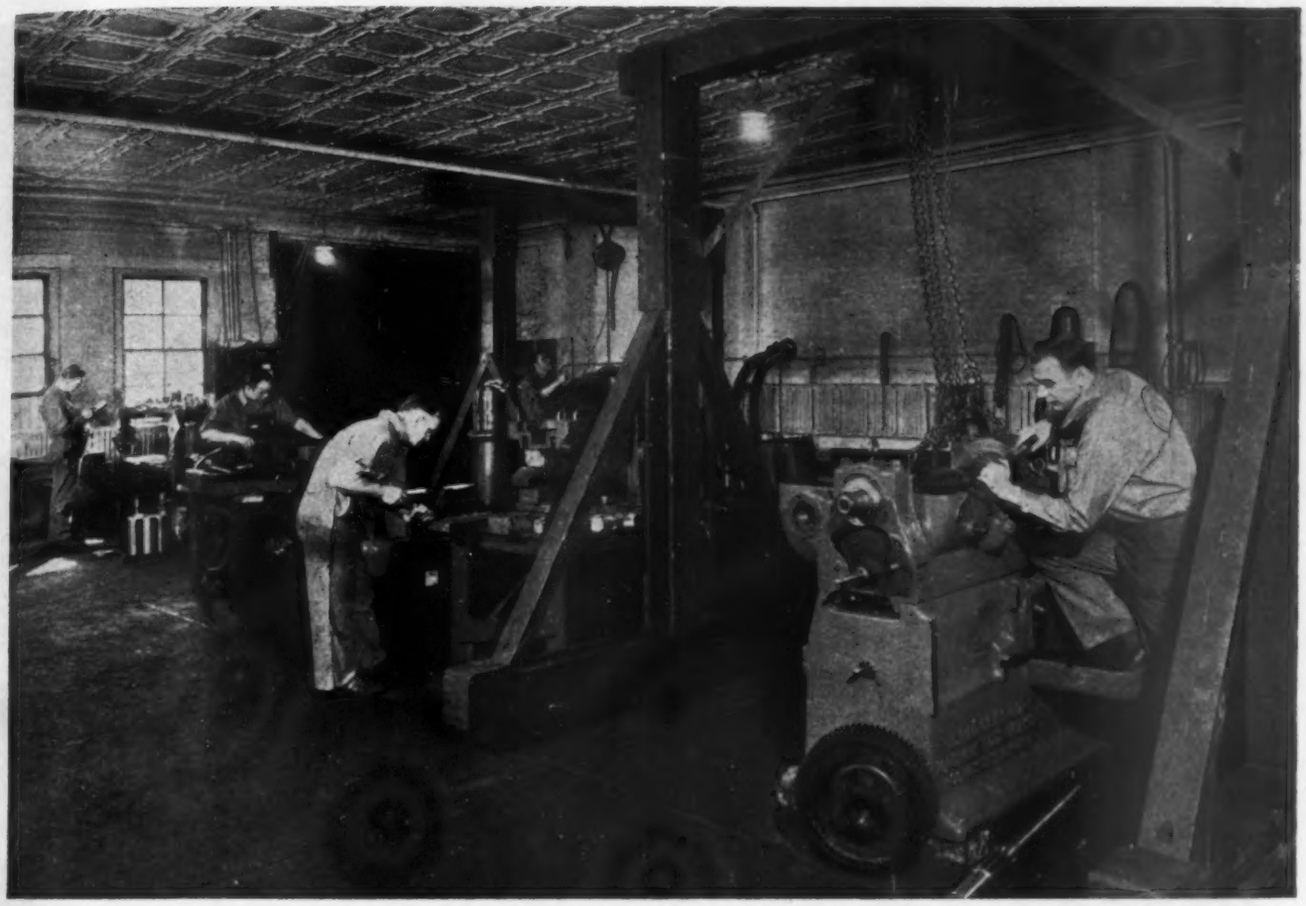
TOILET COMPARTMENTS—utilize 7-ply Douglas fir plywood for partition panels and doors. Known as War-Time compartments, they are offered as temporary substitutes for steel. Sanymetal Products Company, Cleveland. (Figure 17)

WATERPROOF COATING—seals cracks, crevices, and leaky joints. Made with an oil resin base, Renewall dries to a hard finish that is washable, elastic, and durable. For concrete, brick, stucco, cement, or plaster walls. Laid on heavily with ordinary paint brush, leveled with a roller to a smooth, stippled, or other decorative finish. Paint-Point Corporation, Newark.

WATERPROOFING POWDER—called Drye, waterproofs brick, stone, stucco, and mortar joints. Can be used for waterproofing and hardening cement and mortar when included in the mix. Suitable for patching cement floors and bonding tile to cement. Repair cracks in iron. Weather Seal Company, Cincinnati.

WINDOW — formerly of aluminum and steel, now available in wood construction. Horizontal glass-receiving bars are carried in continuous lines across vertical members. Ventilating panels are assembled in the shop, rest of material is delivered in bar form. E. K. Geyser & Company, Pittsburgh. (Figure 18)

WOOD PARTITIONS—of Prefab-Plywood are made in two types. Type P is flush style, uses metal only for the hardware. Type PS is panel style with metal posts and headrail. Complete with all fittings, finished in gray or white enamel. Milwaukee Stamping Company, Milwaukee. (Figure 19)



When regular production overflowed into the space allowed for machine rebuilding, an extra building had to be rented. Here rebuilders can work undisturbed by calls for help around the plant

How We Rebuild Machines

E. A. JOHNSON, Superintendent, Foote Bros. Gear & Machine Corporation, Chicago

Soon after we at the Foote Bros. Gear & Machine Corporation started war production we realized that the machines in our industrial gear division were wearing out faster than they had in the past. Some were already worn to a point where it was difficult or impossible to turn out work to present-day standards of accuracy. Delays in getting new machines were long and deliveries uncertain. We had to take steps to insure that our equipment would meet the demands being made upon it.

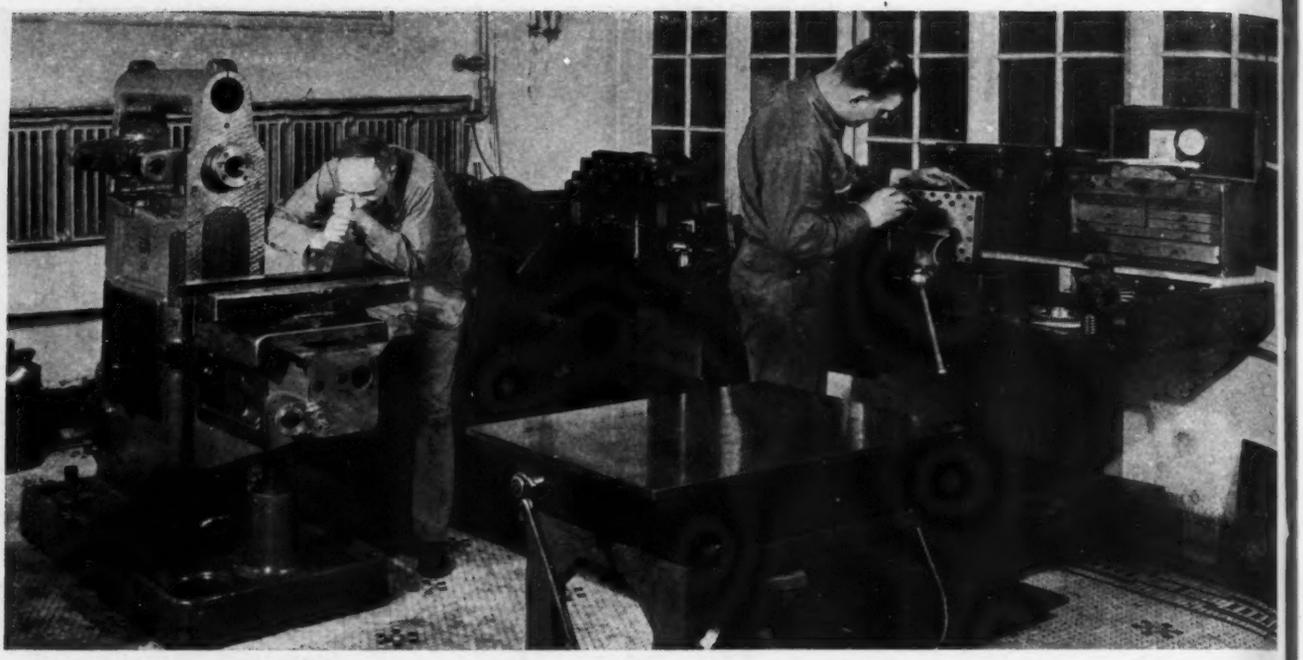
To provide accurate tools, we decided to organize a crew whose members would give their full time to rebuilding and modernizing our machines to put them in condition to handle our increased war work. At first the work was done without moving machines any farther than necessary to obtain working space, but this arrangement proved most unsatisfactory because the rebuilding crew was constantly being called on for emergency service in the plant.

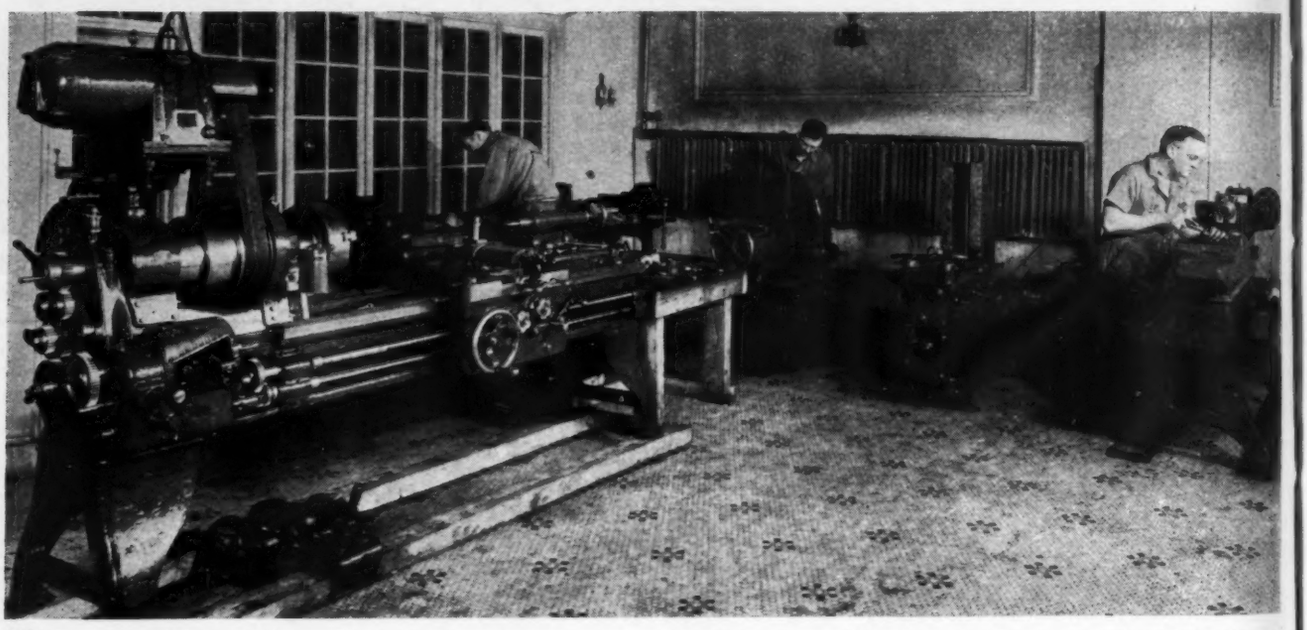
Our next step, therefore, was to establish a rebuilding department and move machines there. There was no room available within our plant, so we rented a building some distance away. Tools and equipment were installed in this building, and the rebuilding men were permanently assigned to the department.

In this way we completely isolate the rebuilding gang, and they stay on rebuilding work; the regular maintenance crews handle all emergency repairs. Accurate cost and time studies can now be made. Scheduling is simplified, and the men are able to meet the schedules.

At present eight men are spending full time on this work. Several of them are experienced in machinery rebuilding. The rest are mechanics and machinists.

A machine tool that can no longer meet our quality standards because of wear or obsolescence is removed from the production floor and transported to the shop. Machines are chosen with reference to their importance and usefulness in production. Frequently the most heavily loaded machines are selected for rebuilding as we cannot risk this type of equipment being below standard. Another type of rebuilding job is taking machines that have not been operating to full capacity and reworking them





When a machine is brought into the shop for rebuilding it is first completely disassembled. All parts are checked for wear and damage, replaced if necessary. Most of them are made right here. Above, a milling machine is in process of repair; in the lower picture a motor drive is added to a lathe

to do the job they were built to do, or adapting them to do a job where we have a shortage of suitable equipment. In doing this we are putting to full use all our production tools.

When a machine is taken to the shop, it is completely disassembled, cleaned, and all usable parts are painted. All parts are carefully checked for wear and damage. Badly worn ones are replaced by new parts purchased, if available, from the makers of the machine. However, most of the required parts are made in the rebuilding department, or in our plant.

Some of the machines brought in are reconstructed for high precision work; usually the new accuracy is better than that originally provided. Other tools have their range increased, or are altered to make products for which they were not designed. Nearly all the machines are converted to individual drive. Frequently several motors are placed on one large production tool. The addition of variable-speed drives is a common practice. Operating speeds are increased whenever practicable. New lubricating equipment and coolant pumps are installed on every reconstructed machine.

About three weeks are required for the rebuilding of each unit. Normally there are several machines "in process" at one time. As one is finished it is returned to production and another is taken to the shop. Lathes, milling machines, hobbers, gear cutters, internal and external grinders have been and are now being rebuilt.

The department was planned as a measure to increase production and to keep all our machines in the best possible repair. The program has proved so successful that we feel that we could not have been operating at our present levels of output and quality without it.

"It's easy to handle ...it must be an Exide"

New workers appreciate the simplicity of Exide Maintenance

INDUSTRIAL RECRUITS, like their more experienced fellows, are learning about the compact efficiency found in Exide Ironclad Batteries. Rugged construction and easy maintenance are important features of an Exide Ironclad. They shorten the training periods of new workers and help deliver surging power for a real War of Movement on the Home Front.

STUDY THESE EASY MAINTENANCE RULES

- Keep adding approved water at regular intervals. Most local water is safe. Ask us if yours is safe.
- Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.
- Keep the battery fully charged—but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.
- Record water additions, voltage and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings.

If you wish more detailed information, or have a special battery problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 1982.

Exide IRONCLAD BATTERIES

1 **HIGH POWER, MORE PRODUCTION:** An Exide Ironclad Battery delivers its power at high voltage to insure good hauling speeds. There's always a giant surge in reserve when an Exide powers your battery-propelled vehicles.

2 **LONG LIFE, SAVES MATERIALS:** Every Exide is built to last, and saves vital materials by squeezing the last ounce of use out of the materials in it. When you buy an Exide you definitely... Buy to Last and Save to Win!

3 **EASY MAINTENANCE, SAVES LABOR:** Exides are kept charged by the simplest method ever devised. With the Exide Charge Control Unit there's nothing to do but connect the battery to the charging source and turn a knob.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
Exide Batteries of Canada, Limited, Toronto

MAINTENANCE SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for

Bicycles are used by Douglas Aircraft for intraplant transportation. A red or orange bike is for special use, but any employee can use a white one

Color Identifies Plant Bicycles

LUCIUS S. FLINT, Los Angeles

Employees going on errands in the large Douglas Aircraft plants hop a bike to get to their destination. Each plant has more than 100 wheels for intraplant transportation. To designate which bicycles are for emergency or specific use and which are for general use, a labeling system has been worked out.

Now plant bikes are painted three different colors. A red bike means "hands off" for plant employees—it is for Army use. The same rule applies generally to orange bicycles. These are for messengers and other civilian employees who use a wheel constantly and must have it for immediate use.

A white bicycle can go anywhere in the grounds, any time, and does not have to be returned to the rack where it was found. The person who take a white bicycle parks it in the rack at his destination. If it's still there when he is ready to return to his home building, he rides it back. If someone else has needed it in the meantime and taken it away, he hops another bike or walks back.

The company reports that, on a collective basis, many thousands of man-hours and a great deal of employee energy are conserved by the use of these circulating cycles instead of foot-power.

Hub Caps Protect Truck Tires

This suggestion won an award from the War Production Board.

Installation of ½-in. cone-shaped disks made from ½-in. steel plate as hub caps on the front wheels of power driven trucks stopped damage to solid rubber tires and steel rims that had been the source of considerable loss. Inasmuch as these trucks operate in fairly close quarters, the front wheels frequently bumped against steel girders or brick walls.

The caps are large enough to act as guards or bumpers for the tires. Since installing these hub caps, there is practically no unnecessary wear on solid rubber tires.

Effectiveness of the cap in protecting the tires is shown in the illustration at the bottom of this page by the condition of the tires on the wheels in the center and at the right. Both tires have had the same usage.

Suggested by Allen E. Fleming, E. I. du Pont de Nemours & Company, Baton Rouge, La.

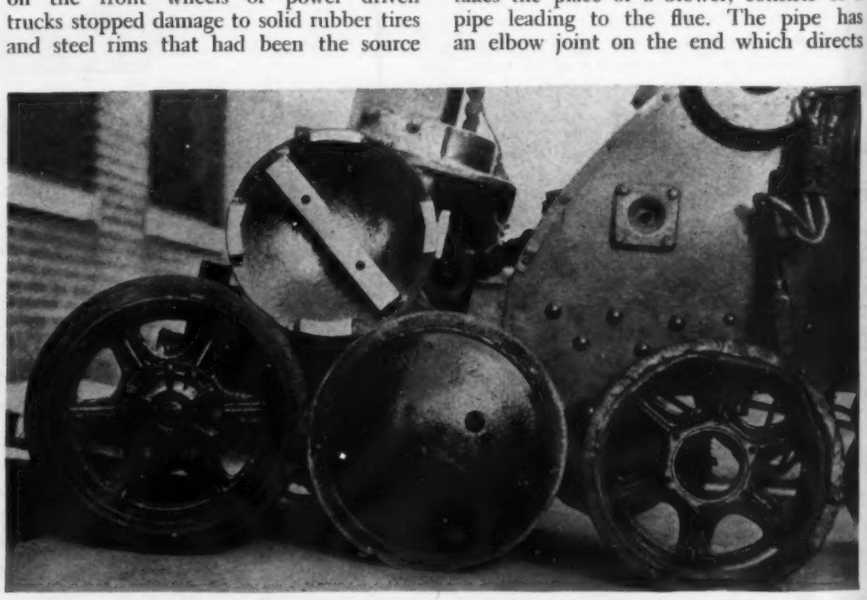
•

Compressed Air Jet Carries Off Fumes

SOURCE—Compressed Air Institute, New York

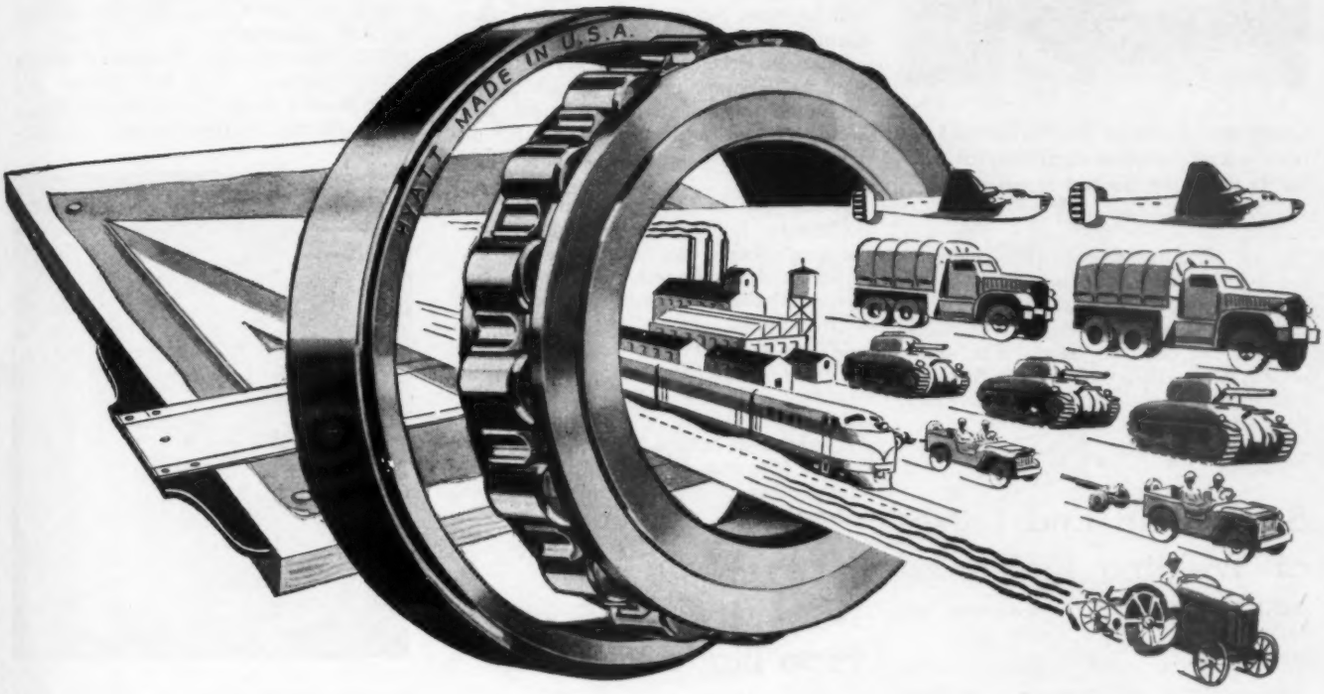
A five-minute blast of compressed air through a tall flue has solved the problem of driving off fumes from an electric furnace used to oil-harden small metal parts at Tinnerman Products, Inc., Cleveland. After the heat has started, the oil that has remained on the metal stampings begins to bake off. By using a blast of air at about 60-lb. pressure per square inch, the fumes are carried off until normal draft from the heated furnace starts.

This home-made appliance, which takes the place of a blower, consists of a pipe leading to the flue. The pipe has an elbow joint on the end which directs



The hub cap shown on the wheel in the center protects rim and tire. The inside of a cap is shown above the center and left wheels

Blueprints of Victory now flow from Boards which conceived America's Industrial Leadership



To design engineers, accustomed to overcoming mechanical obstacles in their stride, the Axis was just another problem for them to lick.

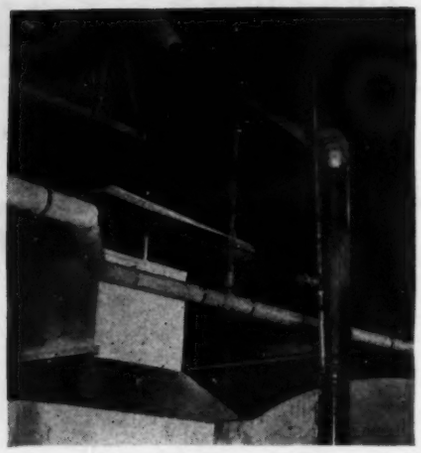
So they reached into their bag of tricks...the old American "know-how"...and came up with a thousand nightmares for the Axis dream.

And in designing these mighty weapons they naturally called on one of their chief stocks in trade—dependable Hyatt Roller Bearings, to help them in the job.

For that reason, you'll find Hyatt Roller Bearings built into the tools of fighting as well as farming, into tanks as well as trucks, into ships as well as machine shops, into warplanes as well as war workers' cars... carrying on their uninterrupted fight against friction and wear, making possible better design and, of course, the better performance which goes with it.

Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

HYATT ROLLER BEARINGS



Compressed air jet in flue carries off fumes from furnace until normal draft starts from the heated furnace

the air upward. This starts the fumes moving upward, also, and, as a steady flow is achieved, the air is turned off and the flow continues until the heat in the furnace is completed. The outlet of the flue is situated at a cupola in the roof where the fumes are taken away by draft.

•

Stops Stub End Losses of Welding Electrodes

GENE JOHNSON, R. G. Le Tourneau, Inc., Peoria, Ill.

To help train welding operators to be waste-conscious and burn their electrodes down to a reasonable standard length, welding rod containers of 30-lb. capacity were fabricated and issued to every operator. This container has a section for stub ends.

It will be seen from the sketch that the electrode container has four compartments. Large rods are placed in the center, small rods in the two side compartments, and stub ends in the front. The base is 3/16-in. material disked to minimize distortion when welding it to the center section, which is prefabricated from pieces of 3x3x$\frac{1}{8}$-in. angles 9 inches long. The side and front sections are 16-gage material preformed before welding to the center box. The handle is a piece of 5/16-in. wire.

Electrode dispensing stations are located convenient to all welding departments. The men in charge weigh out any amount of rod up to 30 pounds upon return of stub ends. Tests have shown that 2-in. stub ends from 30 pounds of rod weigh between 2$\frac{1}{4}$ and 2$\frac{1}{2}$ pounds. Therefore, it is necessary for a welder to have this equivalent in stub ends before he is allowed another full container of rods.

Some welders flip butt ends into the container when changing rods; others, depending upon the job they are doing, will let them fall to the floor and collect them periodically. Our clean-up service benefits in either case, since no butt ends have to be swept up and segregated later on in the reclamation department. Instead, the ends are collected from the dispensing stations and later sold as scrap metal.

Each shift is provided with large tool lockers for holding left-over rods, gloves, welding helmets, and cutting torches. The privilege of holding rods over prevents congestion at the rod bins at the end of each shift.

Partially burned electrodes that were formerly discarded are now used to the standard stub end length. Bending electrodes for welding in difficult locations is permissible only if rods are bent close to the butt end, which helps to preserve the coating and assures full use of the electrode.

•

New Methods Speed Prop Blade Painting

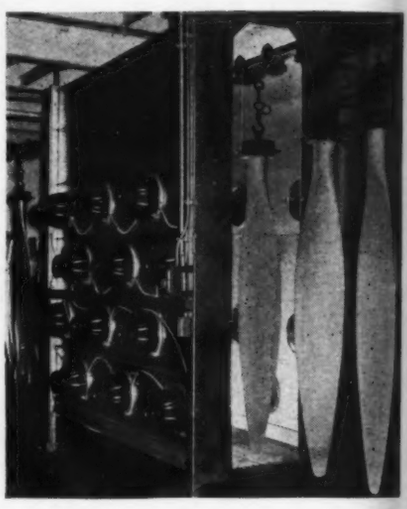
SOURCE — Nash - Kelvinator Corporation, Detroit

An increase of more than 400 percent in the output of the propeller blade painting department has been accomplished by installing batteries of infra-red lamps to cut drying time.

When mass production of delicately balanced hydromatic propellers was first begun in the plant, each blade ready for painting was first carefully cleaned by hand with a lacquer thinner. It was then carried to the spray booth, the butt end was masked with tape, and the blade placed tip up on the floor for a coat of zinc chromate primer. When the primer coat had flashed off, the tip of the blade was sprayed with yellow lacquer (for the safety of night ground crews) and allowed to dry 30 minutes. A double coat of black lacquer on the rest of the blade took 15 minutes' drying time in the paint booth. Another 48 hours of drying time, and the blade was ready for assembly.

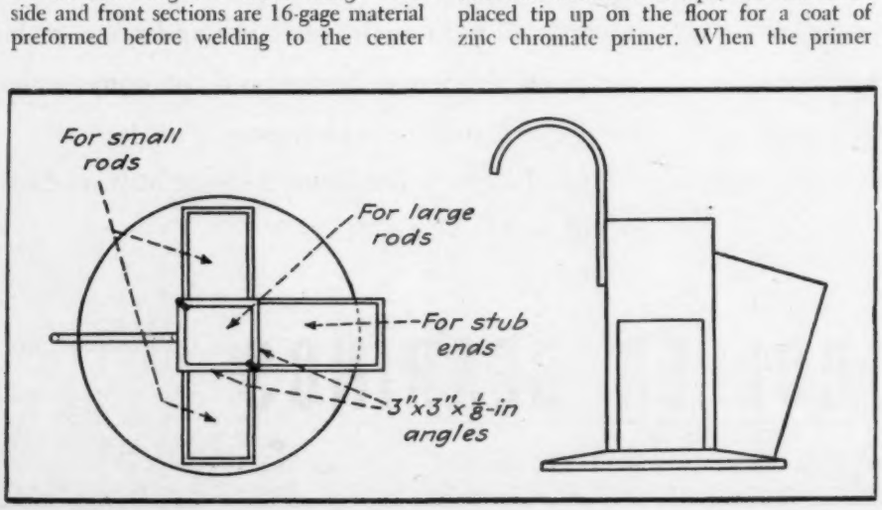
Under a new method, blades are handled in quantities, and are cleaned in a trichlorethylene vapor degreaser system which also heats them as it cleans them. They are hung butt end up in a metal mask on a pusher type monorail conveyor and lowered into the degreaser. Handling is thus cut down and the old masking operation eliminated.

The blades are then transferred onto a power conveyor, and the primer and yellow tip are sprayed on groups of blades at once. After a trip through an infra-red oven, the blades are ready for the masking of the yellow tip and standard coat of black lacquer. To eliminate the 48-hour final drying period, the blades are dried under a battery of infra-red lamps. In less than 4 minutes, they are ready to go to final assembly.



Batteries of infra-red lamps cut final drying time of propeller blades from 48 hours to less than four minutes. The blades ride through the ovens on conveyors

The propeller blades are so carefully balanced during their processing that even the thin film of paint must be applied exactly, and each newly painted blade is checked for perfect balance before it is sent to the final assembly departments.



•

Converting From Oil to Coal Cheaply

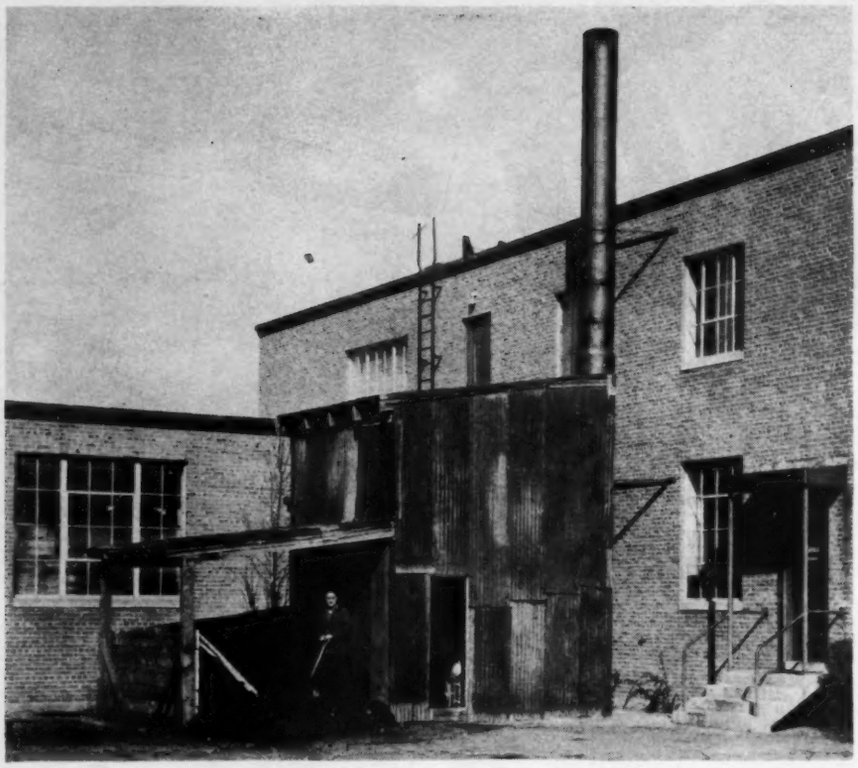
SOURCE—J. A. Wright & Company, Keene, N. H.

When our factory was erected in 1940, no consideration was given to the use of any other fuel but oil. We are not so much interested in steam pressure as in the

TUBE-TURN WELDING FITTINGS—RANGE OF SIZES
TUBE-TURN FORGED STEEL FLANGES—RANGE OF SIZES
SUPER Tube-Turn 45° long radius elbows, 90° long radius elbows, and 180° long radius returns available in both Standard weight and Extra Strong in sizes from 3" to 12".
Tube-Turn welding fittings and flanges conform to applicable ASA and ASTM Standards. For further details please refer to Tube Turns catalog and data book No. 111.
*30" size short radius.
†Dimensions on sizes thru 3½" same as for 600 lb. flanges.
*Dimensions on sizes thru 2½" same as for 1500 lb. flanges.
TUBE-TURN
Welding Fittings and Flanges
The FIRST WELDING FITTINGS 1ST AND STILL THE BEST
TUBE TURNS (Inc.) Louisville, Ky. Branch offices: New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Houston, Los Angeles. Distributors in principal cities.
WELDING RING
BLIND FLANGE
WELDING NECK FLANGE
SLIP-ON FLANGE
LAPPED FLANGE
SCREWED FLANGE
STRAIGHT TEE
REDUCING OUTLET TEE
CONCENTRIC REDUCER
ECCENTRIC REDUCER
LAP JOINT STUB END
STRAIGHT LATERAL
CAP
SADDLE
STRAIGHT CROSS

Type of Fitting	Description	Standard Weight	Extra Strong	Schedule 160	Double Extra Strong	Light Gauge Nominal Pipe Size	Light Gauge Iron Pipe Size
Elbows	90° Long Radius	½"-24"	¾"-24"	1"-14"	1"-8"	4"-24"	3"-12"
Elbows	90° Short Radius	1"-30"	1½"-30"				
Elbows	45° Long Radius	½"-30"*	¾"-30"*	1"-14"	1"-8"	4"-24"	3"-12"
Returns	180° Long Radius	½"-24"	1"-24"	1"-14"	3"-8"		
Returns	180° Short Radius	1"-30"	1½"-30"				
Returns	180° Extra Long Radius	1"-2½"	1"-2½"				
Tees	Straight	½"-24"	½"-24"	1"-12"	1"-8"		
Tees	Reducing Outlet	¾x¾x¾-24x20	¾x¾x¾-24x20	¾x¾x¾-12x10	1x¾-8x6		
Reducers	Concentric & Eccentric	1x¾-24x20	1x¾-24x20		1x¾-8x6		
Caps		¾"-24"	¾"-24"		1"-8"		
Stub Ends	Lap Joint	¾"-24"	¾"-24"				
Nipples	Shaped, 90° to Header	1¼"-12"	1¼"-12"				
Nipples	Shaped, 45° to Header	1¼"-12"	1¼"-12"				
Saddles		2"-24"					
Laterals	Straight	1¼"-24"	1¼"-24"				
Laterals	Reducing	1¼"-24"	1¼"-24"				
Crosses	Straight	¾"-24"	¾"-24"				
Rings	Welding	¾"-12"	¾"-12"				
Sleeves	Welding	2"-24"					

	150 Lb.	300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.
Welding Neck	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Slip-On	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Lap Joint	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Threaded	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Blind	½"-24"	½"- 4"		¼"-3½"			
Socket Type	¼"-24"	¾"-24"	¾"-24"	¾"-24"	¾"-24"	¾"-12"	¾"-12"
Reducing-threaded or slip-on	¾"-24"	1"-24"	4"-12"	4"-12"	3"-12"	1"-12"	
Orifice—threaded		1"-24"					
Orifice—slip-on		1"-24"	4"-12"	1"-12"	3"-12"	1"-12"	
Orifice—welding neck		1"-24"	1"-10"	1"-10"	1"-10"	1"-10"	
Long Welding Neck	1"-24"	1"-24"					



A second-hand boiler, sections of metal stack, used equipment, and building odds and ends took care of "oil to coal" needs of the J. A. Wright plant

quantity of steam which may be quickly available.

When it became necessary to "convert" we found that we did not have storage room for coal, and the conversion of the oil-burning equipment would mean a slow, tedious, and expensive process.

By hunting around we found a second-hand boiler in an old granite quarry nearby. Some sections of metal stack were purchased from several sawmill operators, and welded together. We located a second-hand pressure reducing valve and return pump, and set up this equipment in our parking area. Some used timbers and old corrugated iron sheets were made up into the disreputable looking housing shown in the picture above.

In spite of extreme winter weather, this makeshift unit has done the job. When oil is again available we can switch over in about five minutes' time. The total expense was about one-third of what it would have cost to convert to coal and then back to oil later on, not to mention the savings in time, trouble, and work stoppage.

•

Pilot Light on Lathe Increases Accuracy

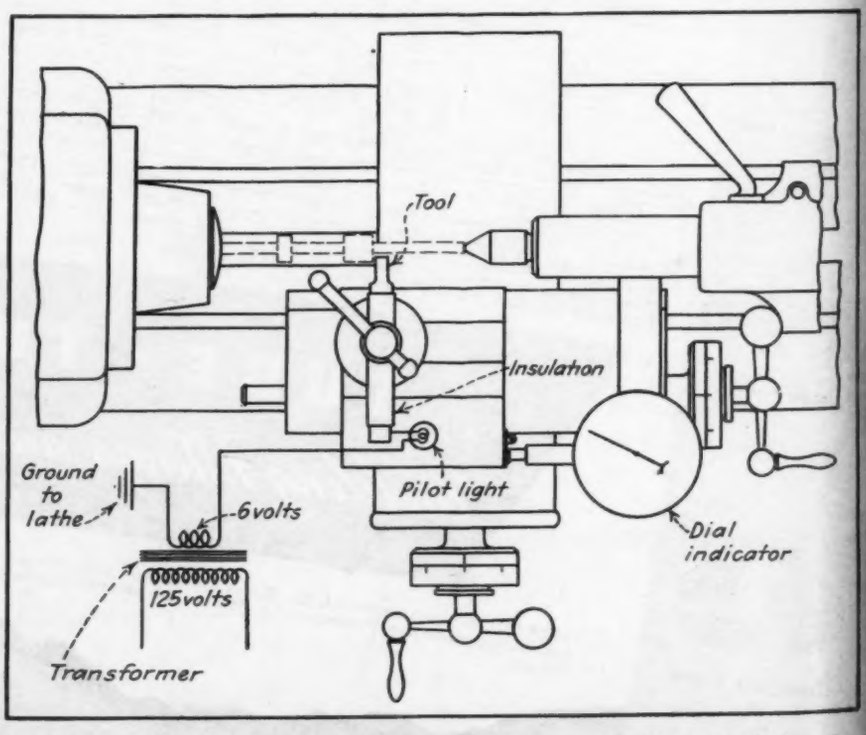
SOURCE—General Electric Company

A pilot light on a precision lathe reduces chances of errors in work for which the tolerance is 0.00005 inch, because it eliminates the human element inherent in the old practice of using a magnifying glass to see when the tool makes contact with the surface to be cut.

The pilot light may be an incandescent or a neon lamp. As the illustration shows, a small transformer is used to reduce the circuit voltage to 6 volts for the lamp. One side of the transformer secondary is connected to the bed of the lathe, and the other to the screw shell of the light socket. The center contact of the light socket is connected to a metal strip that makes contact with the lathe tool when the tool is locked in the post. The tool is insulated from the tool post with varnished cambric or light cardboard.

The tool is brought up to the work in the regular manner until it is just about to make contact. Then it is advanced very slowly until the pilot light flickers. A further slight movement will make the light burn steadily, whereupon the indicator is set at zero. A cut of any desired thickness can then be made. Its accuracy will depend only on the accuracy of the indicator.

A pilot light can also be used where the work is stationary, as on milling machines, by insulating the work from the machine and connecting the center contact of the light socket to the work.



One side of the 6-volt transformer secondary is grounded on the lathe; the other is connected to the tool, which is insulated from the tool post

•

Small Tester Saves Bulbs, Batteries

This suggestion won an award from the War Production Board.

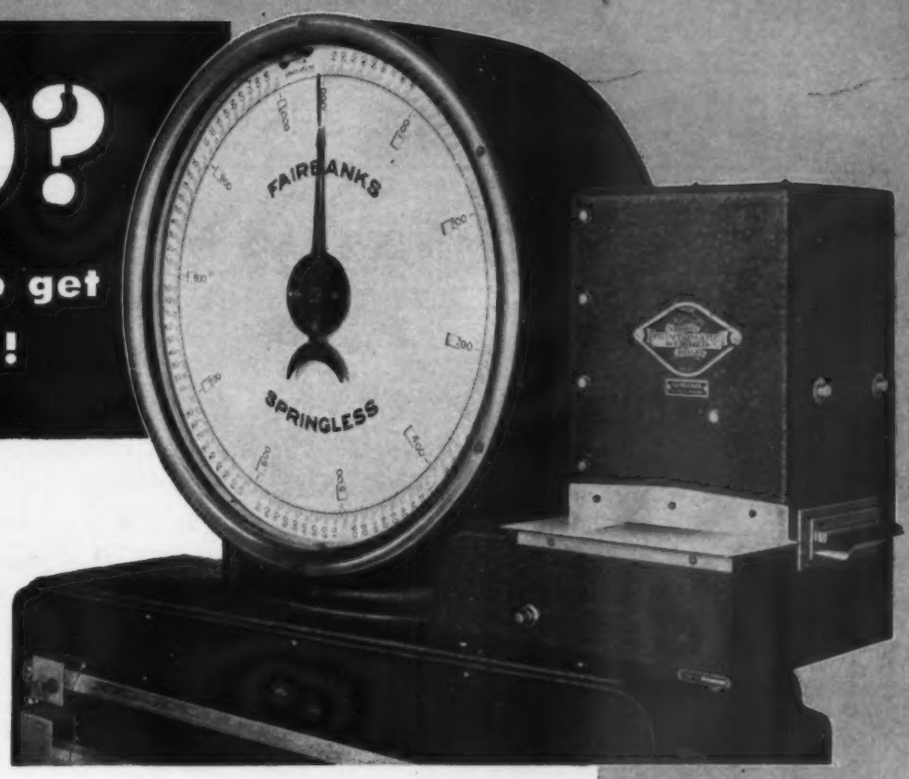
A small tester for testing batteries and bulbs, which brought to light the fact that a large number of batteries and bulbs that had been discarded were still good, has saved about $220 in one department alone during the period of a year.

A simple form on which workmen were required to sign a receipt for new batteries or bulbs also helped to cut down the number used.

Suggested by John Lewis Washburn, Curtiss-Wright Corporation, St. Louis.

GOOD?

They have to be to get where they are!

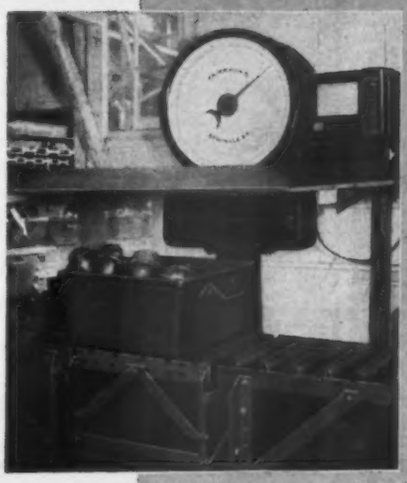


In good light or bad . . . operated by experienced weighmen or novices . . . weighing all kinds of commodities . . . Fairbanks Printomatic Scales have proved to the world that they have what it takes! They eliminate human errors, speed up weighing operations, and provide a PRINTED record showing what was weighed, who weighed it, and when.

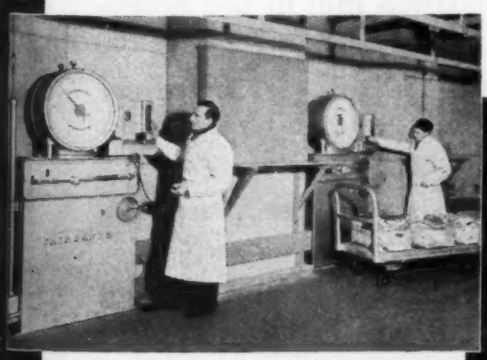
Fairbanks Scales have proved their reliability through their 113 years of service. Each part, carefully designed for its specific function and built with precision, guarantees your incoming, outgoing, and processing weight operations.

The Printomatic records the correct weight automatically, prints it on a roll tape, weigh ticket, or combination of both, or on gummed tickets. Adaptation of Fairbanks Printomatic Scales to weighing problems, simple or complicated, is practically unlimited. Why not investigate what these scales can do for you? Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

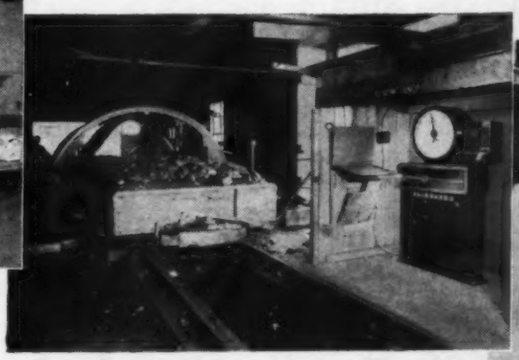
★



Fairbanks Printomatic Conveyor Scale → keeps printed record of piecework in foundry.



↑ Fairbanks Printomatics recording meat shipments to retailers. Each of 221 different kinds of meat is given a designating number.



↑ Fairbanks Coal Mine Car Scale with Printomatic weighs mine cars in motion, protecting employer and miner.

Fairbanks Portable Dial → Scale with Printomatic weighing and printing records of meat to retailers.

FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
SCALES

WATER SYSTEMS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS
RAILROAD EQUIPMENT

FAIRBANKS SCALES

Scales

Prevent Fuel Waste

Surveys have shown that combustion efficiency in the use of much of our coal output is too low, and that effective effort would improve the efficiency of use of at least 300,000,000 tons of coal per year by 10 to 15 percent. Fuel is one of the bulkiest items of transportation. The consumption of less fuel will relieve the mines as well as transportation facilities, an exceedingly important consideration at present. It is estimated that the saving in coal indicated above would be equivalent to a year's output of 25,000 miners, and would fill about 670,000 railroad cars.

Waste of fuel at this time gives definite help to our enemies, and all efforts should be made to prevent it. This country must conserve to the utmost its fuel resources.

It is suggested that fuel users check the following recommendations in their plants, to determine to what extent they are being followed:

1. PREPARATION OF FUEL. Keep the larger and smaller sizes of solid fuels well mixed, if possible. Keep undesirable water out of the fuel.

2. EQUIPMENT. Clean, oil, and repair fuel-burning equipment, and maintain all automatic equipment and controls in proper adjustment. Keep boiler room instruments properly calibrated and in good working order.

3. COMBUSTION. Use no more air than is necessary to prevent too much unburned fuel, including smoke, from going out the stack. Study the flaming of the fire and its color. Watch for dark smokiness. Note fuel bed conditions as to thickness, holes, caking, clinkering, and hot flying particles. Take the temperature of the flue gases and watch the carbon dioxide, if instruments are available. Keep the amount of unburned fuel in the refuse as low as possible. Reburn siftings and fly ash high in carbon.

4. DRAFTS. Keep the draft or suction in the furnace and the windbox pressure as low as possible. Maintain dampers and damper bearings in good condition.

5. USE OF BOILERS. Arrange number of boilers on the line to use the least fuel, avoiding sustained high overloads as much as possible.

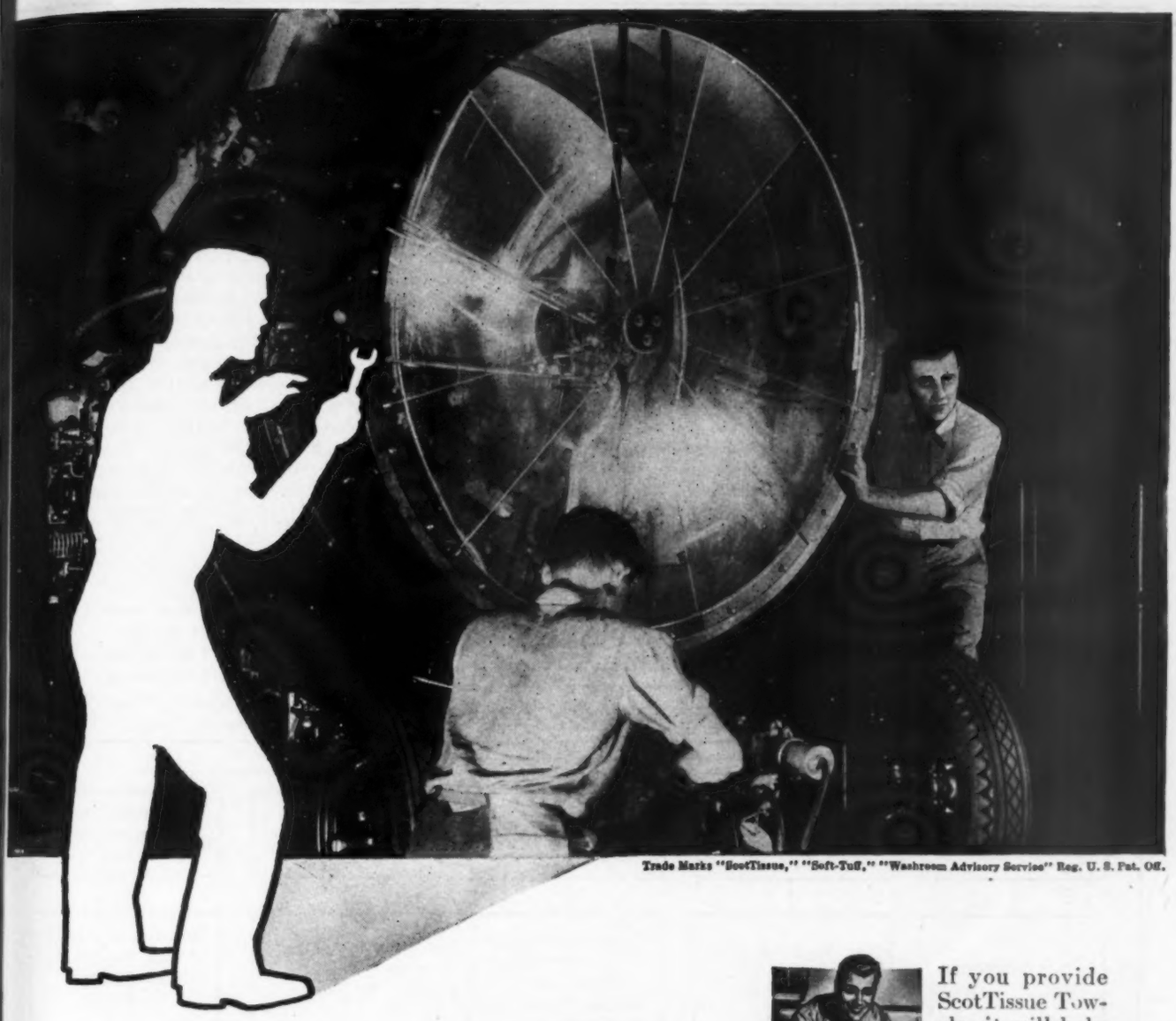
6. BOILERS. Stop all undesirable air leaks in the boiler setting around headers, doors, peepholes, shells, drums, and soot blowers. Keep all heat transfer surfaces clean on *both* sides. Keep furnace brickwork and baffles in good repair, with baffles free from soot and fly-ash piles.

7. BLOWING DOWN. Blow down boilers as little as feasible.

8. LEAKS AND INSULATION. Keep equipment and piping free from steam and water leaks. Insulate hot surfaces to lower heat losses.

9. STUDY YOUR PLANT. Devise fuel-saving schemes peculiar to your boiler plant, including possible changes in equipment.

Prepared by J. F. BARKLEY, Chief, Division of Solid Fuels Utilization for War, Bureau of Mines



Trade Marks "ScotTissue," "Soft-Tuff," "Washroom Advisory Service" Reg. U. S. Pat. Off.

THE MISSING MAN

By reducing sickness, sanitary washrooms increase your manpower

Common contagions, like colds and influenza, cause over half of your absences—more than all other causes combined. This fact makes the plant washroom vitally important. For it can be either a transfer point for contagions, or an effective barrier.

In a clean, sanitary washroom—equipped with soap, hot water and individual tissue towels—millions of germs are washed away before they can do harm.

For maximum hygiene and easy maintenance, have an architect design your washrooms. He will also consider comfort and appearance—important to morale.

THE SCOTT WASHROOM ADVISORY SERVICE

On request, a thorough survey of your washrooms will be made by the Scott Washroom Advisory Service. Its report may reveal many ways to improve hygiene, comfort and efficiency.

If you provide ScotTissue Towels, it will help you prevent their waste . . . so that other companies can share the supply. For example, our educational material reminds workers that *one* ScotTissue Towel dries completely.

Actually, a single "Soft-Tuff" ScotTissue Towel will absorb twice the water left on hands. And it has ten times the rub strength of previous ScotTissue Towels, though soft as ever.

Write for our *Health Is Ammunition, Too* booklet and posters—proven aids in setting up a sound health program.

Scott Paper Co., Chester, Pa.

SCOTTISSUE TOWELS

STAY TOUGH WHEN WET

Passive Plant Protection

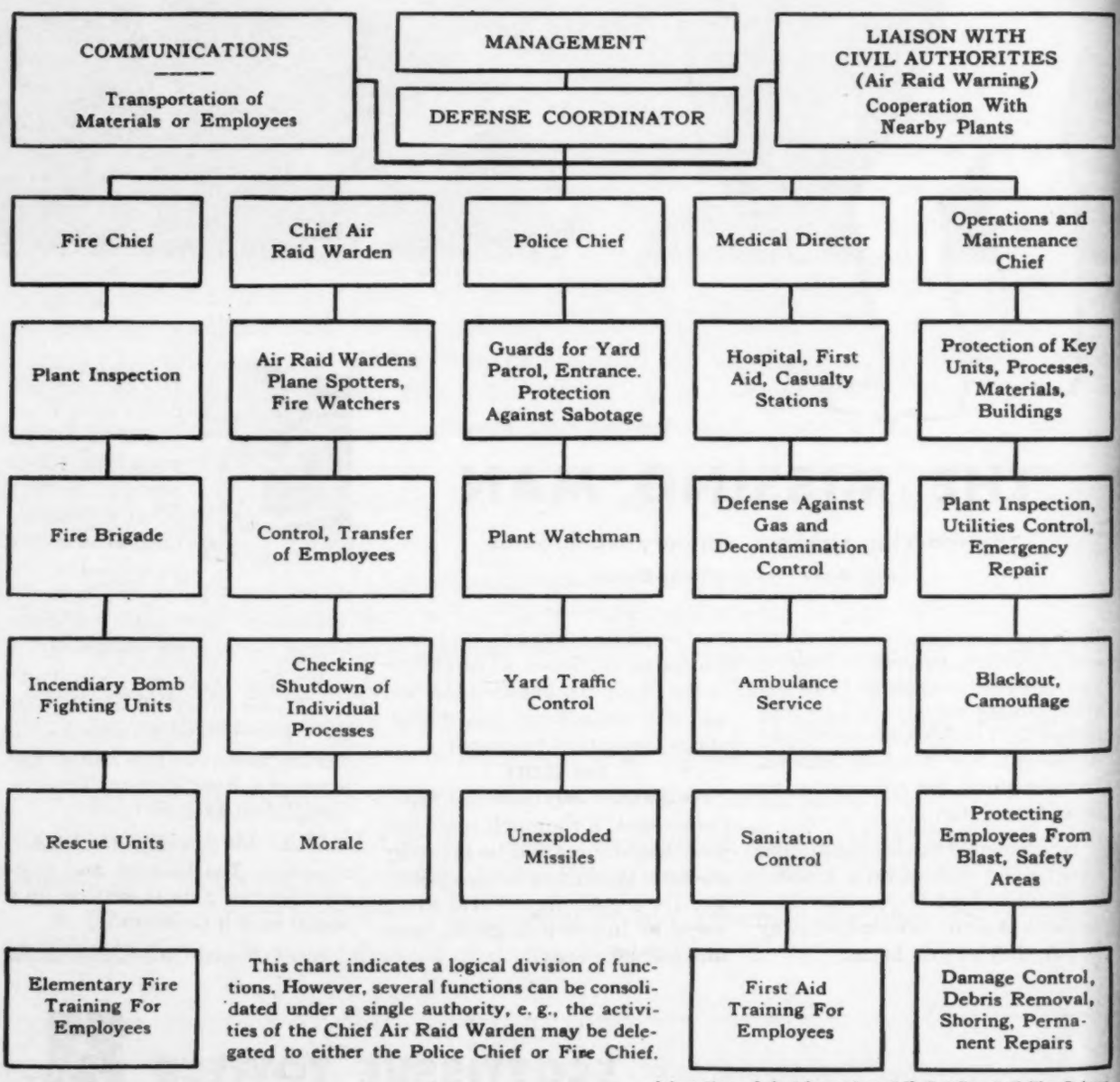
PASSIVE PLANT PROTECTION consists of the protection of production, personnel, property, materials, and products from the effects of air raids or other related emergencies. It can be divided into two categories: (1) Personnel organization and management; (2) physical installations or construction for blacking out, protection, concealment.

In general, the organization of plant defense follows the usual pattern of civilian defense in the community. The defense coordinator, corresponding to the commander of the citizen corps, directs and controls the organization.

The entire system is controlled from a central headquarters, known as the plant control room. Here all reports of damage to the plant are received, and from here the various services are dispatched. Upon receipt of a preliminary air raid warning alert, the defense coordinator reports to the control room. The warning is then transmitted to employees who have been assigned to preparatory defense duties. These men take their stations without disrupting the work of other employees. The general alarm is given when it is thought necessary to interrupt production.

Larger plants can be divided into divisions, each in command of a division coordinator. The basic subdivision is the post. Post areas may correspond to departments, or can be established as separate floors. Each post is under the direction of a post warden —usually the foreman.

It is essential that the coordinator, his deputies, division coordinators, and the chiefs of services should have enough time to become thoroughly proficient in their duties, and they should all wear the official insignia of the Office of Civilian Defense for the service or unit to which they have been assigned.

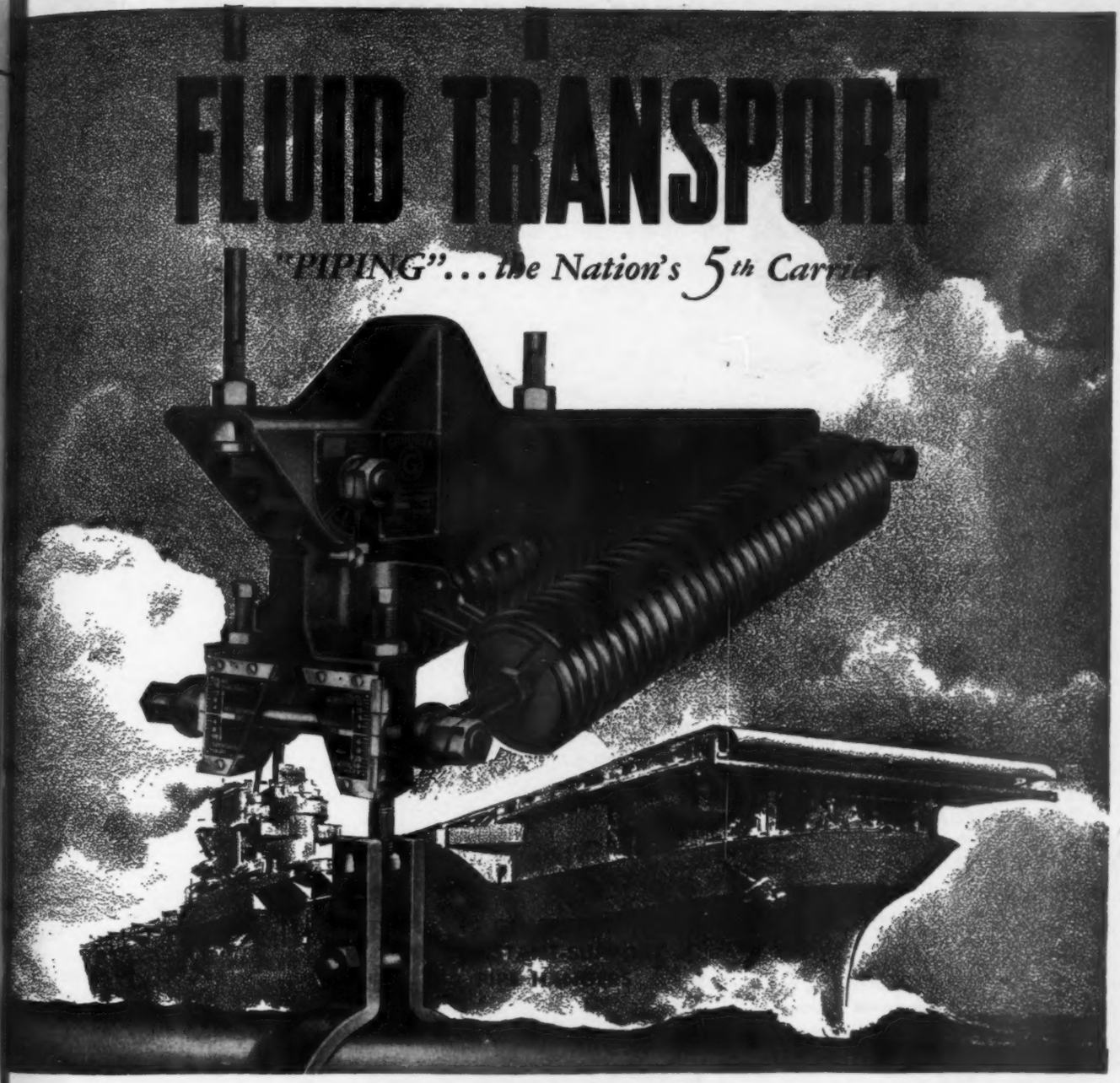


This chart indicates a logical division of functions. However, several functions can be consolidated under a single authority, e. g., the activities of the Chief Air Raid Warden may be delegated to either the Police Chief or Fire Chief.

Information and chart by courtesy of U. S. Office of Civilian Defense

FLUID TRANSPORT

"PIPING"... the Nation's 5th Carrier



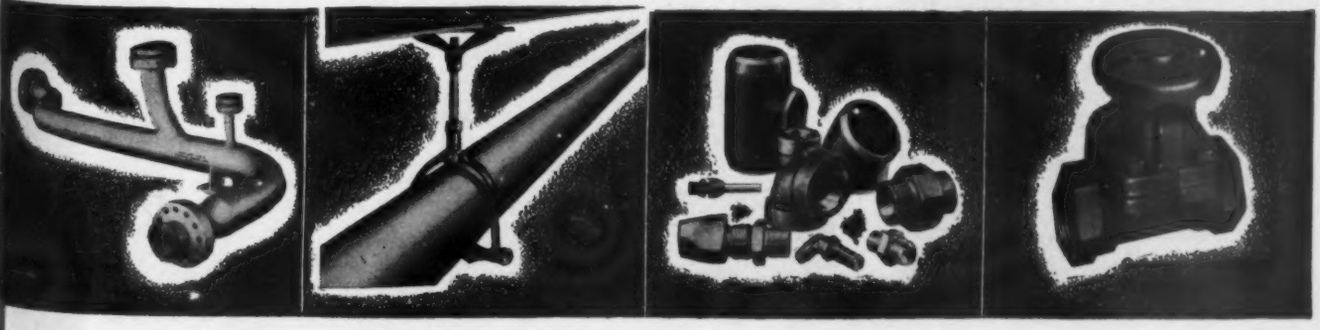
SEAGOING PIPING TAKES AN EXTRA BEATING. Piping must be properly engineered and fabricated to withstand all the punishment that goes with a high pressure steam installation *plus* the extra shocks of rough seas.

Grinnell is meeting these and similar extreme demands for specially engineered piping systems both afloat and ashore. Grinnell plants offer the most modern facilities for fabricating the connecting links which convert a pile of pipe into a complete piping system for efficient FLUID TRANSPORT.

For new war construction and maintenance and repair of existing piping, call Grinnell Company, Inc., Executive Offices, Providence, Rhode Island. Plants and offices throughout the United States and Canada.

GRINNELL

WHENEVER **PIPING** IS INVOLVED



JOHNSON BRONZE

Ledaloyl SELF LUBRICATING BRONZE

POWDER METALLURGY

- *Eliminates Machining*
- *Self Lubricating*

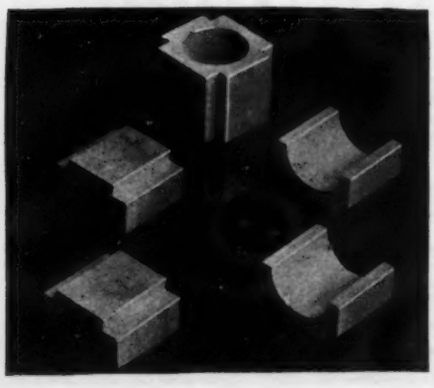
Bearings, bushings or other parts made from Johnson LEDALOYL are usually lower in cost . . . more efficient in operation . . . than when manufactured by any other method.

Johnson LEDALOYL is manufactured from pre-cast bearing bronze. This provides complete control over the bearing structure and lubricating action . . . provides uniform strength and longer life.

Excellent delivery is available on parts made from LEDALOYL. Write — TODAY — for complete information and a copy of our catalogue . . . listing more than 2000 stock sizes.

JOHNSON BRONZE
512 SOUTH MILL ST.
NEW CASTLE, PA.

Ledaloyl is ideal for odd or intricate shapes as it eliminates all machining, provides self-lubrication.



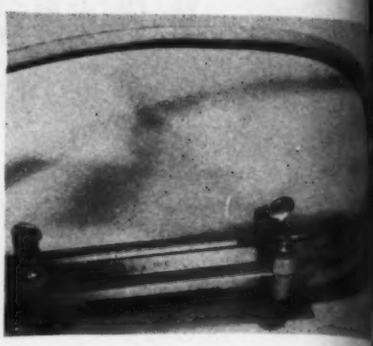
WHAT'S NEW IN EQUIPMENT

Leather V-Belt Drive

New application of the old accepted engineering principle of flat, full-grain leather in contact with pulley sheaves has been incorporated in a V-belt. Flat leather sidewalls have been built to a leather core to produce a long-lived V-belt, according to the manufacturer.

A high friction co-efficient is developed by the grip of the flat leather walls which is claimed to make slack running possible with less wear on V-belt and bearings. Danger of the belt's slipping and of overheated motor bearings is slight.

The leather belts are supplied in rolls. When a new belt is needed the predetermined length is cut from a roll of the cross-section size required, and a feather bevel is made with a miter box. Cement is applied and the belt placed in a special adjustable clamp to make it securely end-

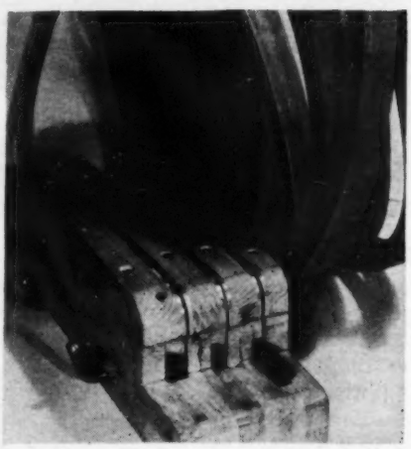


less on the pulley. This feature larg eliminates dismantling of machines, t reducing time lost in shutdown for b changes and adjustments. Removal of o board bearings is unnecessary. Short pie of left-over belting can be spliced to m belts of required length.

According to the maker, oil soaking n not lower efficiency of the belt. Ch A. Schieren Co., 29 Ferry St., New Yo

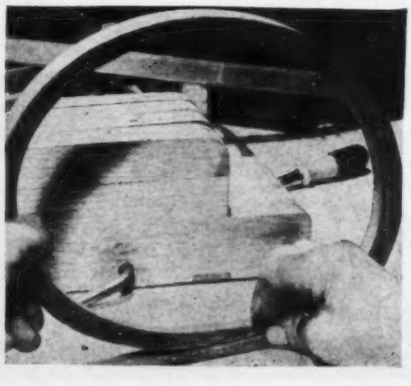
Motor Starter

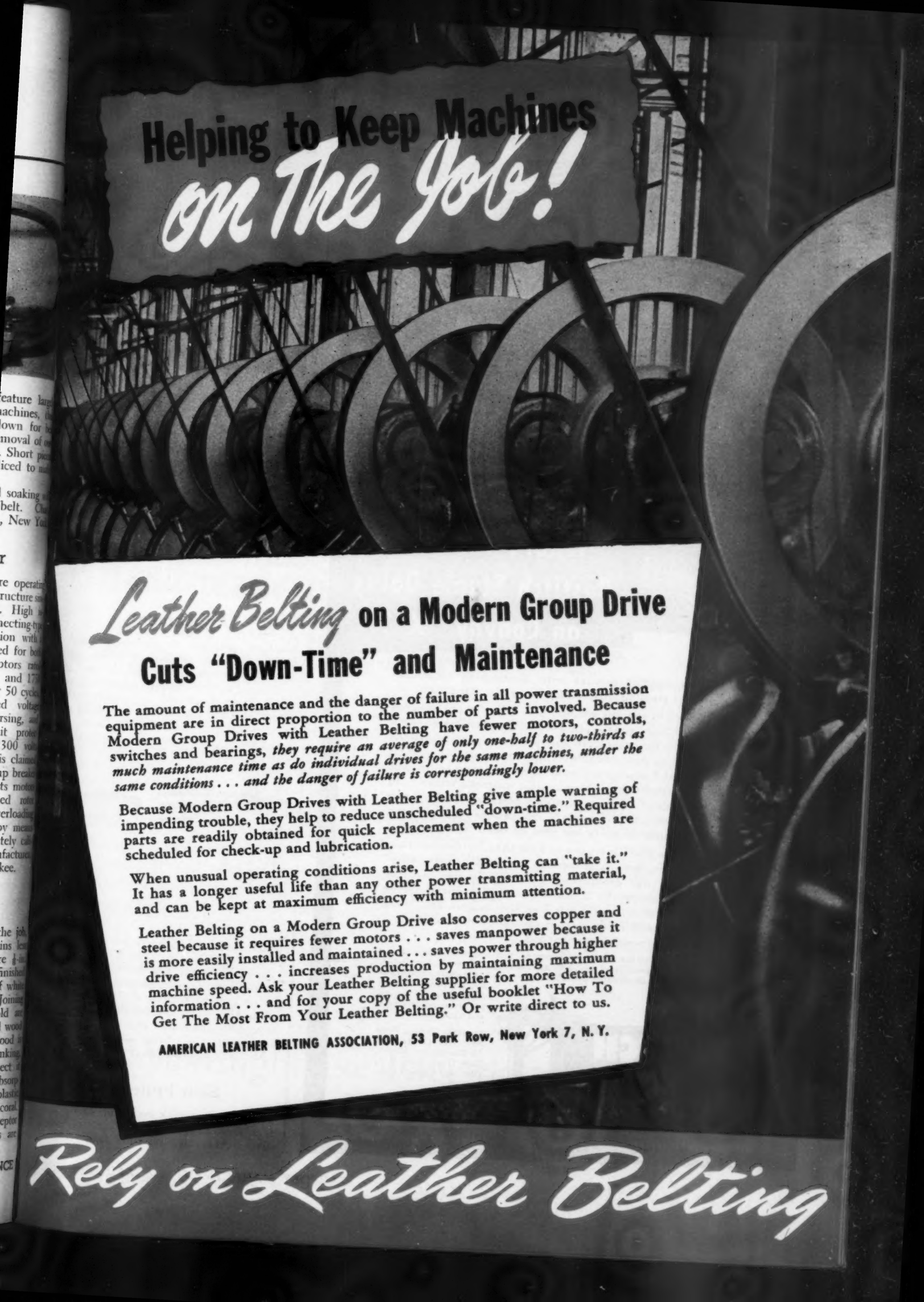
Type H motor starter for severe operati conditions is a metal-inclosed structure si ilar to metal-clad switchgear. High i terrupting capacity disconnecting-ty fuses are utilized in combination with heavy-duty oil switch. Developed for bo induction and synchronous motors rat up to 1000 hp. at 2300 volts and 17 hp. at 7600 volts, 3-phase, 60 or 50 cycle its uses cover full or reduced voltag starting, dynamic braking, reversing, a special applications. Short-circuit prote tion up to 160,000 kva. at 2300 vol and 320,000 kva. at 4600 volts is claime to eliminate the need for a back-up break within those kva. ratings. Protects motor from sustained overloads, locked rot condition, single phasing, and overloadin caused by too frequent starting by mean of a termal overload relay accurately cal brated, according to the manufacture Allis-Chalmers Mfg. Co., Milwaukee.



Cabinet Shower

Designed for quick assembly at the job non-metallic cabinet shower contains le than 1 pound of metal. Walls are ¼-in hard pressed fiberboard and are finished inside and outside with two coats of whit high-temperature baked enamel. Joining members, top frame, and threshold ar fabricated from selected close-grained wood with a baked enamel finish. The wood i treated for the prevention of shrinking, swelling, and warping and to protect it against stain, vermin, and water absorp tion. The receptor is of durable plastic and comes in pastel green, buff, or coral. Sidewalls are attached to the receptor with self-tapping screws. No screws are





Leather Belting on a Modern Group Drive Cuts "Down-Time" and Maintenance

The amount of maintenance and the danger of failure in all power transmission equipment are in direct proportion to the number of parts involved. Because Modern Group Drives with Leather Belting have fewer motors, controls, switches and bearings, *they require an average of only one-half to two-thirds as much maintenance time as do individual drives for the same machines, under the same conditions . . . and the danger of failure is correspondingly lower.*

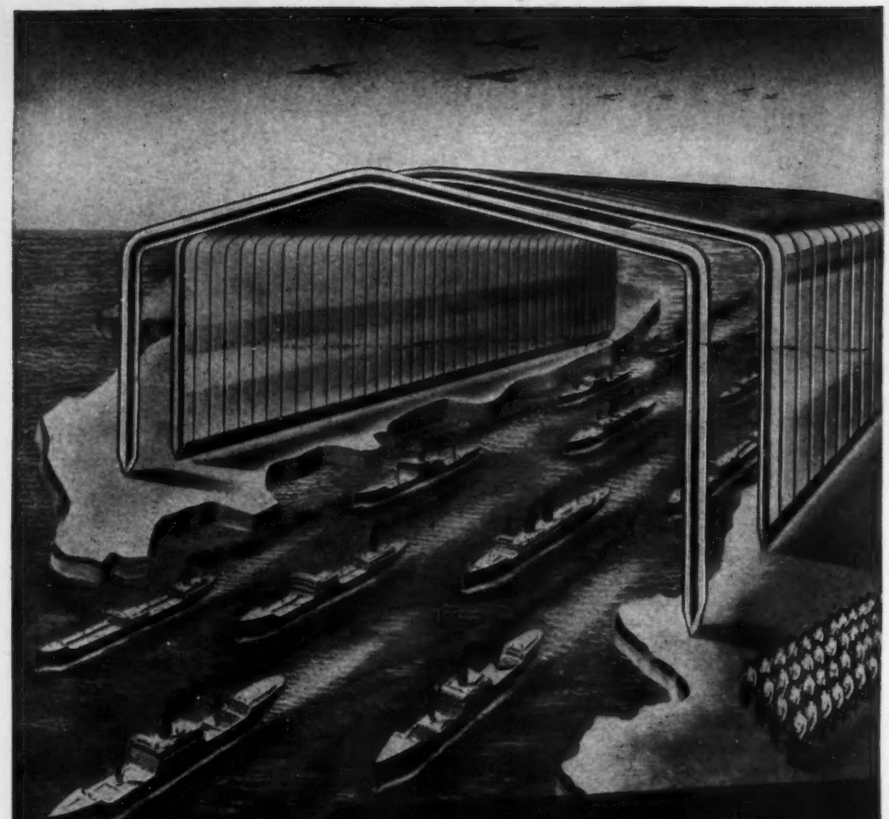
Because Modern Group Drives with Leather Belting give ample warning of impending trouble, they help to reduce unscheduled "down-time." Required parts are readily obtained for quick replacement when the machines are scheduled for check-up and lubrication.

When unusual operating conditions arise, Leather Belting can "take it." It has a longer useful life than any other power transmitting material, and can be kept at maximum efficiency with minimum attention.

Leather Belting on a Modern Group Drive also conserves copper and steel because it requires fewer motors . . . saves manpower because it is more easily installed and maintained . . . saves power through higher drive efficiency . . . increases production by maintaining maximum machine speed. Ask your Leather Belting supplier for more detailed information . . . and for your copy of the useful booklet "How To Get The Most From Your Leather Belting." Or write direct to us.

AMERICAN LEATHER BELTING ASSOCIATION, 53 Park Row, New York 7, N. Y.

Rely on Leather Belting



What's This Little Bostitch Staple Doing on Convoy "X"?

THE CARGO bristles with Bostitching (machine-applied stapling) drafted for the war . . . for SPEED!

Speed in shaping ammunition belts for our soldiers to feed their guns . . . in assembling plastic scabbards for their bayonets . . . in steel-stitching parts for planes and tanks they will ride . . . in linking portable landing fields and emergency roadways . . . in the equipment that protects their ships against magnetic mines . . . in hundreds of other applications newly created for war purposes . . . in thousands of applications regularly used on civilian products but now enrolled in war service!

These wartime uses are further evidences that "Bostitch fastens it better, and faster, with wire." Meeting war production challenges is also creating new and improved Bostitch tools and applications for future use . . . nearly 800 Bostitch models and types make possible the right combination of machine and staples for each particular job.

If you have the necessary priorities, find out *now* if Bostitching can help speed your production . . . if priorities are not available, investigate Bostitching *now* so that you can apply these advantages and improvements immediately to quick post-war adjustments and production.

Bostitch, (Boston Wire Stitcher Company) 76 Blackmore Street, East Greenwich, R. I. (Bostitch-Canada, Ltd., Montreal).

BOSTITCH

fastens it better, AND FASTER with wire

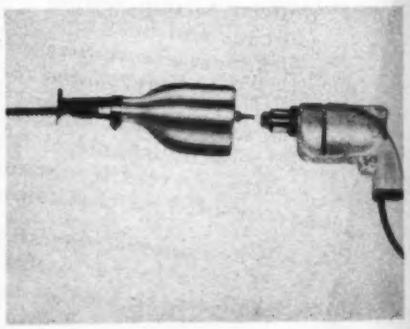
ALL TYPES OF STAPLES APPLIED BY MACHINES
ALL TYPES OF MACHINES FOR APPLYING STAPLES

MOTORIZED STAPLER 1 of the 800

exposed on the exterior. Standard equipment for the cabinet includes a zinc-coated iron two-valve combination concealed type unit with shower head; cast drain with wrought strainer assembled integral with floor receptor; soap dish; curtain rod integral with top frame; and sanforized white duck curtain with plastic hangers. An exposed zinc coated iron unit with head and gooseneck riser pipe may be substituted for concealed shower. Size 32 inches square by 75 inches high, weighs 200 pounds. A 30-in. square unit also is available. Claimed leakproof. Henry Weis Mfg. Co., Inc., Elkhart, Ind.

Attachment

Saw-Gun, attached to an electric drill, flexible shaft, or compressed airline, becomes a portable power saw or file. It will saw or file plastics, heavy sheet metal, castings, or rod in hard-to-reach places, and will cut directly into wood or



plastic without drilling hole for starter. According to the manufacturer the Saw-Gun can be easily attached to a drill and is simple to operate. Recommended for use on drill with speed of 2000 r.p.m. or more. Also comes as a complete unit with heavy-duty drill and chuck. Mid-States Equipment Co., Saw-Gun Div., Dept. F.M., 2429 S. Michigan Ave., Chicago.

Skin Protector

Neo-Film, protective agent for hands and skin against the action of cutting oils, many chemicals, solvents, and fumes,

ONLY AN ELECTRICAL WHOLESALER COULD THUS SPEED WAR PRODUCTION

Hand-made light fixtures saved 60 days

Wesco-built In 6 Hours They Enabled War Dam Night Shift to Start On Time

Construction of the Pacific Coast hydro-electric dam was losing the race against war plant power needs. A night shift was established but special weatherproof lighting fixtures were unobtainable for 60 to 90 days. The General Superintendent phoned Wesco in the emergency—"At 5 tonight 12 reflectors to meet our needs must be ready."

The Wesco manager knew that dim-out regulations forbade the use of floodlights. The solution was to suspend weatherproof reflectors from cables stretched across the ravine. But suspension fittings could not be had. Combing his stock, the Wesco Manager put together a 1000 Watt reflector, a close pipe nipple and a type "C" condulet and thus improvised a thoroughly waterproof lighting unit. The 12 fixtures were made in 6 hours and were ready on time.

Wesco ingenuity and know-how will be at the service of business and industry following the unconditional surrender of the Axis.

WESCO SPEEDS WAR PRODUCTION

* War plant burned down on a Friday was operating on the following Monday—thanks to Wesco's prompt delivery of motors, switches, wire, and other items from local stocks.
* Within three days Wesco completed delivery of 68 different items to an important war plant. Best delivery of other sources was 12 weeks.

WESCO SERVES BUSINESS

* By buying large quantities at low prices and passing the savings on to small-quantity buyers.
* By furnishing informative and technical data.
* By knowing local and national codes and rulings.

Westinghouse Electric Supply Co.

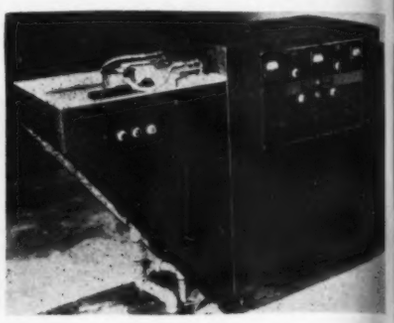
150 VARICK STREET • • NEW YORK (13), N. Y.

A NATIONAL DISTRIBUTING ORGANIZATION WITH 80 BRANCHES

comes in liquid form. Easy to apply, it dries quickly to an elastic "visible glove." Oilproof and antiseptic, one application is said to be sufficient for the work period. Washes off with soap and water. Also has a curative agent. Jones Medical Laboratories, 800 Huron Rd., Cleveland.

Heaters

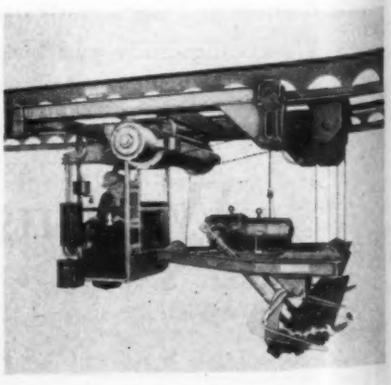
A line of electronic heaters for high-frequency induction heating of metal parts for brazing, soldering, and selective heat treating has been announced. Essentially power oscillators which convert 60-cycle power to high-frequency at approximately 500,000 cycles, the heaters are available in two standard sizes—one having an output of 5 kilowatts and the other an output of 15 kilowatts. A work table with the



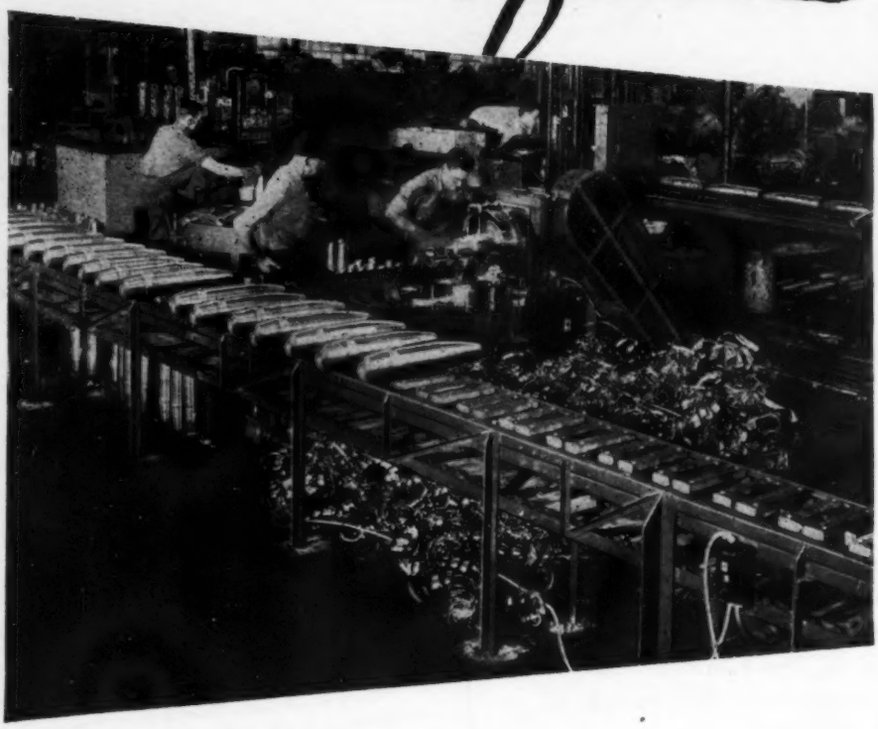
necessary water-cooled coil or coils connected to the heater terminals is attached to the heater. Heats are repeated by locating the piece in the inductor coil and initiating the automatic cycle by operating a pushbutton. Direct current supplies the oscillator circuit, which consists of grid-controlled vacuum tubes shunted across a parallel resonant circuit. The heater coil is connected in series with the parallel resonant inductance by means of connectors. A timer in the oscillator permits automatic timing of the heating cycles. General Electric Co., Schenectady.

Overhead Carrier

Motor-driven pipe and rod carrier permits the cab operator to pick up to 1500 pounds of stock in 12-ft. lengths from the storage room, transport, and set it in racks at fabricating machines without any floor men. Pick-up fork assembly has a three-point rope suspension from the carrier which gives it rigidity for handling off-balance loads. Double overhead track

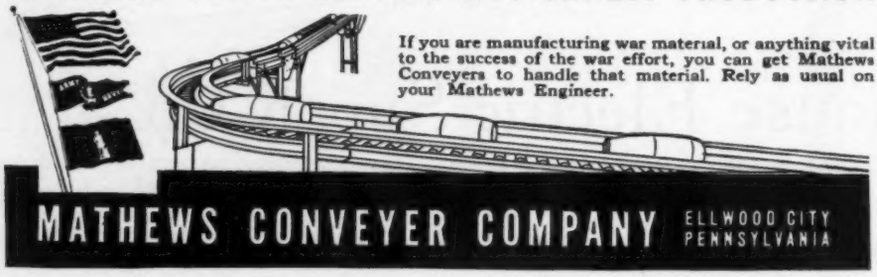


DISH IT OUT *faster!*



THAT'S THE WAY TO WIN this war . . . and that's the way to speed the production of vital war material. Keeping materials, parts and supplies moving to waiting machines and eager hands with a Mathews Time-Controlled Conveyer System is a sure-fire means of making production schedules "click." Mathews Engineers are helping American War Industries dish it out faster; perhaps they can also help you.

MATHEWS CONVEYERS FOR MECHANIZED PRODUCTION



If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.

MATHEWS CONVEYER COMPANY ELLWOOD CITY PENNSYLVANIA

Fresh Air for More Work

YOU CAN MAKE IT EASIER FOR YOUR MEN TO PRODUCE MORE WORK BY PUTTING A COPPUS BLOWER OR HEAT KILLER ON THE JOB

WHERE it's hot or stuffy, working efficiency sags.

But with Coppus "Blue Ribbon" Blowers and Exhausters on the job ...you can keep men cool and comfortable working near furnaces ... in tanks ... in underground cable manholes ... around hot processes.

They're portable, adaptable for special purposes, each one built to Coppus "Blue Ribbon" standards—which means precision-workmanship, rugged construction.

Get more work from men whose work helps win the war. Coppus Blowers and Exhausters will save those lost minutes that add up to so many wasted hours each day.

CABLE MANHOLE AND TANK VENTILATORS — BOILER MANHOLE BLOWERS AND EXHAUSTERS — HEAT KILLERS — SHIPHOLD VENTILATORS ... DESIGNED FOR YOUR INDUSTRY — ENGINEERED FOR YOU

MAIL THIS COUPON To Coppus Engineering Corp., 207 Park Avenue, Worcester, Mass. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in SWEET'S CATALOG.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fusilages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets, etc., after treated with coating material.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....

(Write here any special ventilating problem you may have.)

DARNELL
CASTERS & WHEELS

Can help you

PRODUCE FOR VICTORY

These precision made casters and wheels will help you speed up production . . . will pay for themselves many times over. Investigate today!

Write . . .
FOR NEW DARNELL MANUAL

★

A SAVING AT EVERY TURN

DARNELL CORP. LTD., 60 WALKER ST., NEW YORK, N.Y.
LONG BEACH, CALIFORNIA, 36 N. CLINTON, CHICAGO, ILL.

system on which carrier travels minimizes swing and slipping of materials. Rod and pipe are handled by two forks, tilted upward when loading or downward when unloading by a motor-driven crank. A limit switch automatically stops forks in upward or holding position when the fork mechanism is not in operation. A lift of 8 to 20 feet can be furnished. Hoisting speed is 20 ft. per min., traveling speed 300 ft. per min. Carrier can be supplied for loads of heavier capacity and of different lengths. Cleveland Crane & Engineering Co., Tramrail Div., Wickliffe, Ohio.

Cement Pipe

Extruded asbestos-cement pressure pipe called Eternit has been introduced for use in chemical plants, pulp and paper mills, and other industries. Smooth-surfaced inside and out, the pipe is rustproof, a nonconductor of electricity, and is claimed im-

mune to tuberculation and other forms of internal corrosion with necessitate periodic cleaning or increase of pumping pressure. According to the manufacturer, the pipe can be cut with a hack saw and coupled immediately without machine preparation at joints. Made in standard lengths of 13 feet, the pipe comes in diameters up to and including 6 inches. Ruberoid Co., 500 Fifth Ave., New York.

Fluorescent Fixture

Meeting critical material weight requirements of WPB, non-metallic reflector is completely inclosed. It is anchored to the top housing with captive latches which release with a simple quarter turn. Chain hanging ears on 43-in. centers; ½-in. knockouts on 18-, 24-, 30-, and 36-in. centers; channel for adjustable slide-grip hangers; and knockout for levolier pull chain switch permit speedy and economical installation. Hanging accessories are furnished for any industrial installation. Simple joining straps are available for joining a group of units into continuous rows. Model HF-100R, using two 40-watt fluorescent lamps, has a wattage of 100; HF-150R, with three 40-watt fluorescent lamps, has a wattage of 150; and

PRINTED IN THE U.S.A.

THE "MAGIC BRAIN" OF *Any Electronic Equipment* IS A TUBE . . .

and the fountainhead of modern tube production is RCA

LET'S LOOK AT THE RECORD!

To a greater degree than any other manufacturer, RCA has solved the problem of turning out in quantity, high quality Tubes expertly engineered to the requirements of the practical user.

In the field of "Receiving" Tubes, RCA is looked to by the government as well as many other critical customers as producing an eminently satisfactory product—and doing it in tremendous quantities.

In Cathode-Ray Tubes, RCA was the first to produce well-engineered units at low cost, thus making them available to industry generally.

RCA has long led in Phototube development, meeting one newer and more exacting application after another. Included here as RCA "firsts" are such outstanding developments as the RCA-931 Multiplier Tube, and other Phototubes utilizing the famous S4 surface which is highly responsive to daylight and blue light.

RCA first developed the Beam Power Tube in the "Receiving" field, subsequently carrying this important development into the field of Transmitting Tubes.

In the field of Ultra-High-Frequency Tubes, RCA was the first to bring out Acorn Tubes—and, later, many others, among them such important Tubes as the RCA-1628 (and its successor, -8012), -825, -827 and RCA-832.

In Power and Transmitting Tubes, RCA was the first to design a successful air-radiator for cooling heavy-duty units.

Time and again, RCA has anticipated the need for new or improved Tube types, often pioneering them far ahead of any commercial demand.

And always RCA has led the way with Application Engineers in the field. These practical men apply their specialized talents to the dual objective of developing better tubes for the job at hand, and finding ways to use tubes already available to better advantage.

BUY U. S. WAR BONDS AND STAMPS

RCA RADIO-ELECTRONIC TUBES

RCA Victor Division, **RADIO CORPORATION OF AMERICA**, Camden, N. J.

PUMPS WITH NINE LIVES

Internal view showing buckets which fit loosely into rotor recesses.

BLACKMER
·ROTARY·
PUMPS
with
BUCKET DESIGN
(Swinging vane principle)

These pumps are

SELF-ADJUSTING FOR WEAR

20 years of service is not unusual for a Blackmer Rotary Pump. There is no loss of capacity during the life of the buckets. When finally worn out, the head plate of the pump is removed, the old buckets pulled out and a new set (4) inserted. As the buckets are self-adjusting no fitting is necessary.

Blackmer pumps are handling materials varying in characteristics from butane to asphalt at temperatures up to 600°F. and pressures to 300 psi.

POWER PUMPS
5 to 750 GPM—to 300 psi
All standard drives.

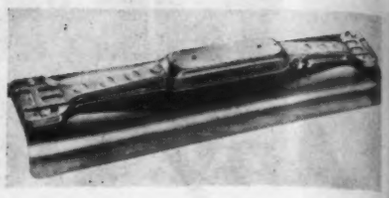
HAND PUMPS
7 to 25 GPM.
54 different models.

Ask for Bulletin No. 301: Facts about Rotary Pumps

BLACKMER PUMP CO., 2107 Century Ave., Grand Rapids 9, Mich.

CONSULT BLACKMER ENGINEERS ON YOUR PUMPING PROBLEMS

BLACKMER Rotary PUMPS
"BUCKET DESIGN"—SELF-ADJUSTING FOR WEAR



HF-235R, using two 100-watt fluorescent lamps, has a wattage of 235. All units are available for 110–125 or 220–250 volts, 60-cycle a.c. Fixtures come complete with lamps and starters. Sylvania Electric Products, Fluorescent Fixture Div., Ipswich, Mass.

Heavy-Duty Extractors

Double purpose extractors, for removing stub ends of pipe, nipples, tube, bolts, or screws, are of forged tool steel with heavy square shank followed by a sharply tapered, short reverse thread ending in a square reaming end. By inserting the

tapered end in the stub, a strong four-point grip is obtained. The built-in square reamer automatically removes burrs. Continued increased pressure of a wrench on the squared shank positively pulls the broken piece outward on its threads. Ten cadmium-plated extractors, packed in an oak case with hinged cover, make up the set and cover the entire range of pipe from ¼ to 2 inches and bolts or screws from ⅜ to 3¼ inches. Reps Tool Co., Inc., 99 Wall St., New York.

Color and Hardener for Concrete

Penetrating concrete hardener, which eliminates the need for etching to neutralize the alkaline content of concrete and dyes the cement at the same time, is available in six colors and clear. Called Dye-Crete color hardener, the material, after application, is allowed to dry from one to two hours. Dye-Crete Defensite coating is then applied for a gloss-texture finish. For an enamel finish, the coating is applied in the original color. For a colorless, non-dusting surface, clear hardener is applied in two coats. A drying time of 12 hours is required for the first coat. Coverage ranges between 250 to 400

BY-PRODUCT OF WAR

Some day, perhaps before very long, we must face the responsibility of putting to good use the most promising by-product of war—the great development of our industrial capacity.

When peace comes, this capacity to produce will remain. The machines will be there, and the highly skilled men and women who run them.

Acme-Gridley Automatics have been carrying a growing share of this production load. No other machines can produce so much, in so short a time, of such uniformly high quality, at so low a cost.

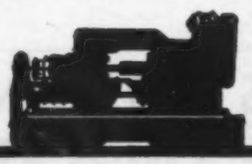
Under the urgencies of war, costs are less important than speed and volume. But we have learned how to produce more goods faster—with Acme-Gridleys—and we can apply this knowledge to produce and sell at prices that will permit the whole world to buy from us.

That is where we must look for broader markets, increased consumption, steady employment.

In the post-war picture, as in manufacturing today, the place of automatic bar and chucking machines—of Acme-Gridleys—is already firmly established.

The NATIONAL ACME *Company*

CLEVELAND · OHIO



ACME-GRIDLEY AUTOMATICS
maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

SATISFYING

How DEVOPAKE hides and covers any surface *in just one coat!*

The master painter is satisfied . . . the maintenance man is satisfied . . . management is satisfied when each sees what an economical and thorough job Devopake does on any interior wall surface . . . and in *one* coat. Economical Devopake steps up efficiency because it improves *seeing* conditions by providing maximum reflection and diffusion of available light.

Look at the advantages of Devopake over ordinary flat wall paints:

Devopake **covers more surface per gallon.**

Devopake **hides solidly . . . in one coat . . . over any type of interior wall surface.**

Devopake's **big brush workability (or easy application by spray) puts it on quickly, evenly.**

Devopake **is a self-sealer and finish-coat in one. It eliminates usual undercoat . . . saves man hours.**

Devopake's **toughness enables it to stand up under hard wear and repeated wash-downs.**

Devopake **now comes in 7 practical, ready-mixed colors.**

Our strong claims for Devopake are fully substantiated by our customers' experiences. Discover for yourself the many advantages of this outstanding Devoe paint.

DEVOE & RAYNOLDS CO., INC.

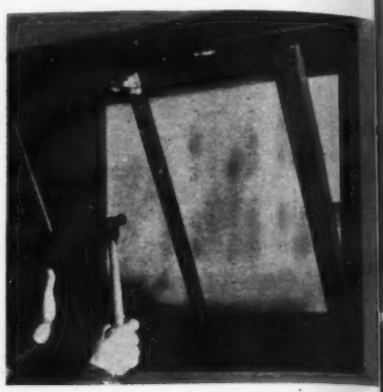
The 189th Year of the Oldest Paint Maker in America

FIRST AVENUE AT 44th STREET, NEW YORK, N. Y.

square feet per gallon, depending on t surface. Is claimed to be highly resist to traffic wear. Wilbur & Williams C Park Square Bldg., Boston.

Glazing Material

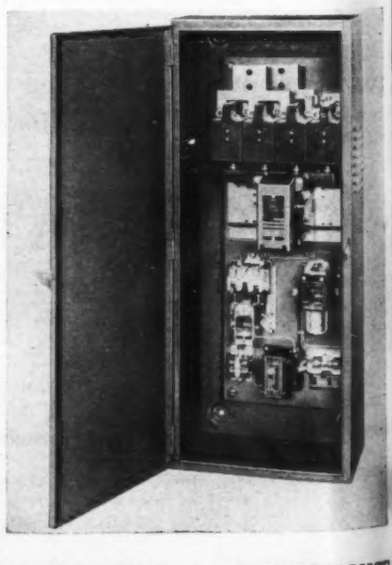
Shatterproof plastic and wire mater called Lumapane is available for use partitions and windows where there danger of explosions. It is easily stalled in wood or metal frames, and



claimed to have excellent insulating prop erties and to provide a fair degree o vision. This material is lightweight an flexible enough to fit unusual contours Lumapane is said to be unaffected b changes in temperature and humidity, and can be cleaned with a cloth dampened with water or kerosene. A product o Celanese Celluloid Corp., Lumapane is distributed by The Anderson Corp., Bay port, Minn.

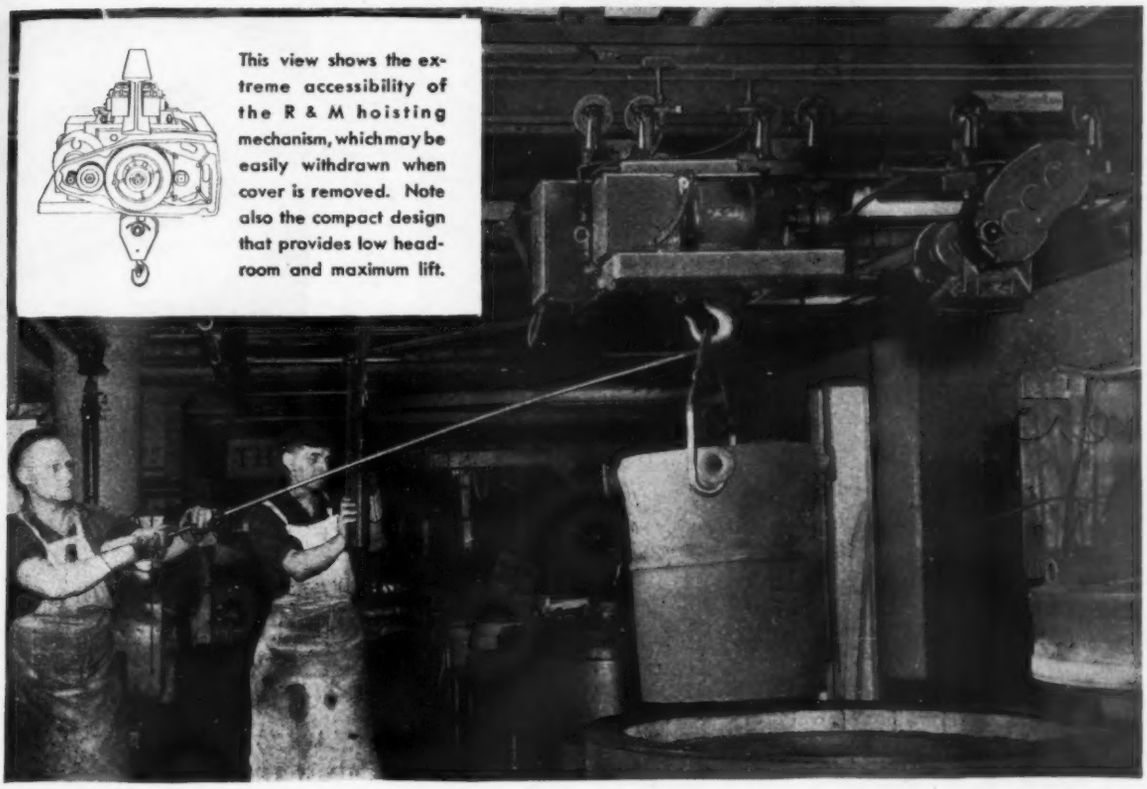
Control

Safety panel, which eliminates the hazard created by high open-circuit voltages o transformer type a.c. arc welders by auto matically disconnecting the welder trans former after the arc is broken, has been announced. The transformer is automati cally reconnected when the operator touches the electrode to the work. With this panel, the welding transformer primary circuit is connected to the power line only while the arc is held. Panel can be used



International Business Machines Speeds Work with 41 R & M Hoists!

They're saving time and labor in many departments



This view shows the extreme accessibility of the R & M hoisting mechanism, which may be easily withdrawn when cover is removed. Note also the compact design that provides low headroom and maximum lift.

Around the clock and around the calendar, a squadron of 41 R & M All-Steel Hoists is helping International Business Machines Corporation do a *great* war job. A typical installation is shown above, lifting a heavy ladle in I. B. M.'s heat treating department. The labor of several husky men is saved for other vital work—and the job is done in a fraction of the time.

These hoists help other departments keep humming at top speed, too. They handle raw materials quickly, lift heavy jigs and fixtures with utmost safety, help make machine setup changes in a hurry and keep the finished products rolling from the shipping department to railroad cars.

Here are just a *few* of the reasons why R & M All-Steel Hoists have "what it takes" for war production. They're precision-built from track to hook; they're powered by famous R & M motors; they're perfectly balanced; they're equipped with an oversize oil-cooled automatic load brake. Hundreds of R & M models, from 1000 to 15,000 lbs. in capacity, are available to fit any application.

Whatever *your* hoisting problem, "take it up" with R & M! Our expert representatives will help you find the solution. Call the nearest R & M sales and service office, or write us.

R & M HOIST AND CRANE SALES AND SERVICE OFFICES

Albany.....364 Broadway
Atlanta.....319 Walton Bldg.
Baltimore, Lombard & Concord St.
Boston.....74 Needham St.
Chicago....2400 W. Madison St.
Cincinnati.....418 New St.
Cleveland..470 Rockefeller Bldg.
Denver.....1420 16th St.
Detroit.....2921 E. Grand Blvd.
Houston..3715 Harrisburg Blvd.
Jacksonville....305 Bisbee Bldg.
Meriden, Conn..135 Colony St.
Newark.....700 Bergen St.
New York.....200 Varick St.
Philadelphia.....401 N. Broad St.
Pittsburgh.....H. W. Oliver Bldg.
Providence.....44 Clifford St.
San Francisco, 116 New Mtgmry. St.
Seattle.....216 Walker Bldg.
Syracuse...204 State Tower Bldg.
Montreal.....Lyman Tube & Supply Co., Ltd.

KEEP 'EM HOISTING!

If you have R & M equipment, send for new maintenance folder, "How to get the most out of your Robbins & Myers Hoists and Cranes."

ROBBINS & MYERS • INC

HOIST & CRANE DIVISION, SPRINGFIELD, OHIO • In Canada: Robbins & Myers Co. of Canada, Ltd., Brantford, Ont.

★ ★ ★ MOTORS • MACHINE DRIVES • FANS • MOYNO PUMPS • FOUNDED 1878 ★ ★ ★

BURNS HEAL FASTER WITH NEW BIO-DYNE TREATMENT

...saves valuable man-hours

A new concept in healing . . . discovered at a world-famous research institute

Every day saved in getting a man *back* on the job means just that much more vital production.

That's why the medical directors of more and more plants are turning to the new Bio-Dyne treatment for burns. For this newly-discovered healing agent, developed as a result of 7 years basic research in a leading research institute, has achieved a marked shortening of the period of disability in industrial burn cases.

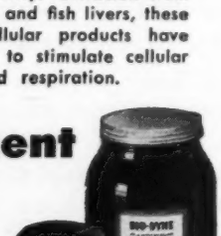
In exhaustive research *and* in ever-increasing practical applications in hospitals and first aid centers, Bio-Dyne Ointment has consistently demonstrated that it not only heals more rapidly, but also has many additional advantages: (1) Ease of application and treatment; (2) Almost immediate relief of pain; (3) Acceleration of rate of epithelization; (4) Keeps tissues soft, minimizing scar and keloidal tissue formation.

Representative case histories are available on request. If you wish to order a supply of Bio-Dyne Ointment now, use the coupon.

WHAT ARE BIODYNES? They are neither hormones nor vitamins. Biodynes are newly-discovered substances given off by injured cells which regulate cellular activity. Extracted from living cells and fish livers, these natural cellular products have the power to stimulate cellular growth and respiration.

BIO-DYNE Ointment

No other preparation for use by physicians and hospitals contains biodynes.



SPERTI, INC.

Dept. F-3, Beech and Kenilworth Aves., Norwood Station, Cincinnati, Ohio

Please ship by_____

_____jars 15-oz. Bio-Dyne Ointment....$ 5.50 per jar

_____jars 5-lb. Bio-Dyne Ointment..... 21.50 per jar

Terms: 2%—10 days—net 30 days

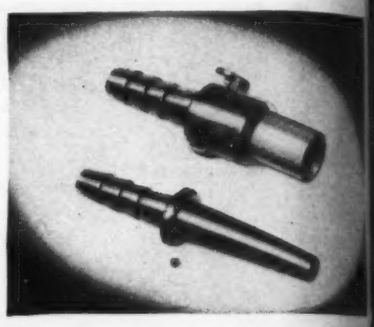
*Name*_____

*Address*_____

with any make or model of a.c. transform arc welder. External connections are simp and internal connections of the welde need not be disturbed. Square D C Industrial Controller Div., Milwaukee.

Plastic Nozzles

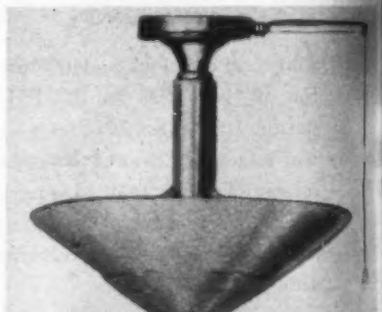
Durable light plastic nozzles for fire fig ing are claimed corrosion-proof, non-de ing, and resistant to acid, alkalis, liqui and water. Two types are produced. On



has a two-way or split stream for formi a spray, but can be instantly operated a one-way stream by depressing a thumb spring. The second type is a one-wa straight-stream nozzle. Both nozzles ar furnished for standard hose sizes of in extinguishers, tanks pressure-operated b stirrup pumps, and other fire-fighting equipment. American Molded Product Co., 1751 N. Honore St., Chicago.

Extension Arm

To eliminate rubbing of lamp pull cord against reflectors, shades, and bowls a levolier extension arm has been developed.

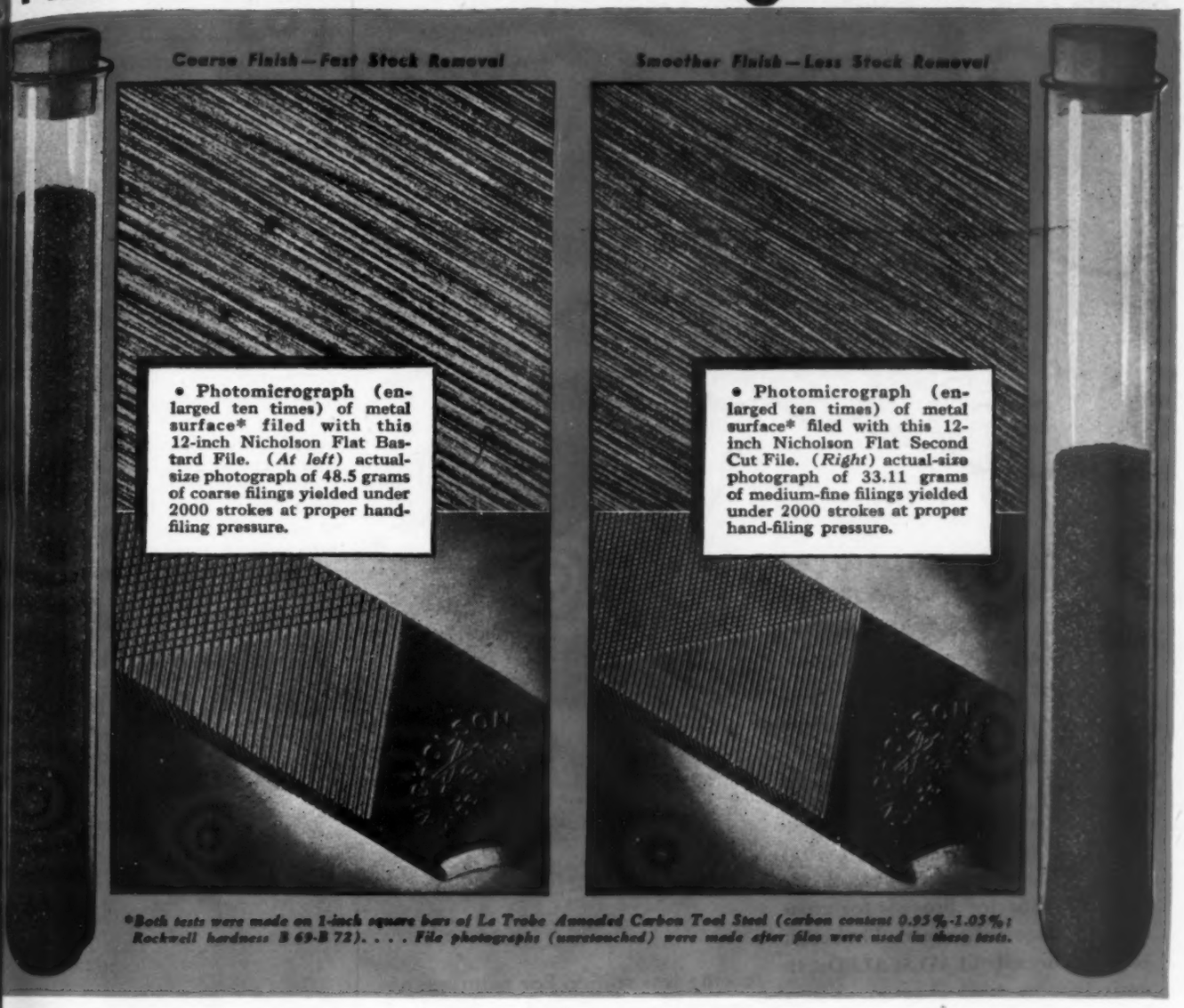


This unit is designed to fit over the levolier switch lever. The pull cord is threaded through the end hole or the loop of the extension arm and attached to the chain on the lever. McGill Mfg. Co., Inc., Valparaiso, Ind.

Grab

Grab for handling boxes of varying lengths consists of two comparatively light gripping ends with pointed gripping face. Lifting and gripping are done by means of a chain. For handling narrower boxes the chain length may be shortened by hooking onto the attachment on the grab ring. Made in sizes from ½ to 10 tons.

"PHOTO FINISH" with a Big Difference


Coarse Finish—Fast Stock Removal
Smoother Finish—Less Stock Removal
• Photomicrograph (enlarged ten times) of metal surface* filed with this 12-inch Nicholson Flat Bastard File. (*At left*) actual-size photograph of 48.5 grams of coarse filings yielded under 2000 strokes at proper hand-filing pressure.
• Photomicrograph (enlarged ten times) of metal surface* filed with this 12-inch Nicholson Flat Second Cut File. (*Right*) actual-size photograph of 33.11 grams of medium-fine filings yielded under 2000 strokes at proper hand-filing pressure.

*Both tests were made on 1-inch square bars of La Trobe Annealed Carbon Tool Steel (carbon content 0.95%-1.05%; Rockwell hardness B 69-B 72). . . . File photographs (untouched) were made after files were used in these tests.

IN FILING production, skill is important. But the comparative tests photographically illustrated above show clearly that *The right file for the job* is highly important toward making that skill yield its utmost. (The wrong file wastes time, reduces efficiency, produces the wrong finish—and often spoils the work.)

These tests, among many made continually in the Nicholson test laboratory, show the work of two regular Nicholson Machinists' Files used under identical conditions by highly skilled mechanics. Similar tests with other types and cuts of files will reveal equally interesting comparisons.

Ask yourself, "What's the job and what's the metal; what's the finish and what's the time the job warrants?" Do they call for rapid stock removal—and much or little; for rough, medium or precision results?

If you have a filing problem that is particularly troublesome, send us a detailed description. Our engineering service will gladly undertake to *find* the answer for you.

And—if it's maximum production per *right file*, or per *file-dollar*, you seek, top-quality Nicholson or Black Diamond brands will fully reward your search. Consult your mill-supply house.

FREE REPRINTS

of this advertisement. Contains excellent instructive material toward training new workers. How many copies shall we send you?

FREE BOOK, "FILE FILOSOPHY" (48 pages). Among the many interesting facts and illustrations on files and filing, it covers notable differences in design and results between regular files and special-purpose files for Aluminum, Stainless Steel, Brass, Foundry Castings, Die Castings, Shear Tooth and Lathe filing. A valuable shop-school "textbook."

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FOR EVERY PURPOSE

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PROCESS DEVELOPED BY CONTINENTAL FOR COATING STEEL WITH LEAD BRINGS A NEW STEEL SHEET WITH DEFINITE ADVANTAGES FOR MANY PRODUCTS . . . SAVES CRITICAL MATERIALS

• After many years of experimenting and testing, the Continental Steel Corporation has developed a new and superior process for coating steel sheets with lead. The result is Continental LEAD-SEALED, an entirely new steel sheet.

The ability of lead to resist weathering and chemical corrosion is better than that of any other metal economically available for protective coating of steel. Its adoption has awaited only a coating process which would adequately seal the steel within its armor of lead.

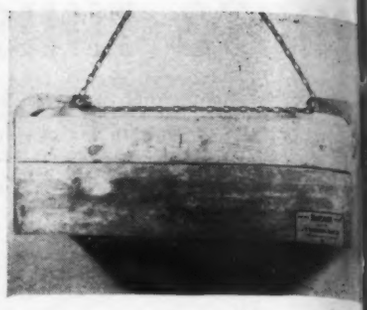
LEAD-SEALED has many manufacturing advantages. It is ductile, and the coating is an effective lubrication for die forming. Soldering is easy, needing no flux or acid, and taking less solder. For painting, no preparation is needed, and the lead coating takes and holds paints and enamels. It offers new economies in fabrication, new perfection in products, and incidentally saves critical materials such as zinc and tin.

TRY IT!

For war-time production problems, and for peace-time plans, get acquainted with Continental LEAD-SEALED. If you are a user of coated steel sheets, we invite you to write and describe your product and requirements. We will send information and a sample of LEAD-SEALED.

CONTINENTAL STEEL CORPORATION
KOKOMO, INDIANA

SUPERIOR
CONTINENTAL STEEL CORPORATION



one or more grabs may be used on spreader bar for handling wide, lo crates. J-B Engineering Sales Co., 3 East St., New Haven, Conn.

Insulating Cement

"No. 1" non-corrosive insulating cem has been developed to prevent the ru ing of metal surfaces which causes cem insulations to peel. A rust inhibitor claimed to prevent corrosive action ev when allowed to air-dry over a long peri of time. Made from high-temperature re sisting black rockwool, the insulator claimed effective up to 1800 degre F. Baldwin-Hill Co., Trenton, N. J.

Fluorescent Lamp Starter

First starter to carry a "3-year rating" i called the Watch Dog. It is a manual reset type for 40-watt lamps, and is timed to light the lamp at the right instant. Close tolerances in the starter's mechanism

make possible a quick and positive performance in the lockout of dead lamps, eliminating blinking and flickering when a lamp burns out. No cooling or waiting period is required before removing dead lamps. When a dead lamp is removed, the starter is reset by pressing a button on its top end. When the new lamp is inserted, the starter brings it into the circuit immediately. General Electric Co., Bridgeport, Conn.

Ventilator for Welders' Helmets

A ventilator for welders' helmets has been devised to eliminate the danger of poisoning by galvanizing fumes and to banish smoke from within the helmet. Called the Cleanaire ventilator, it is easily attached to the headband of the helmet. By a scientific formula an even flow of fresh

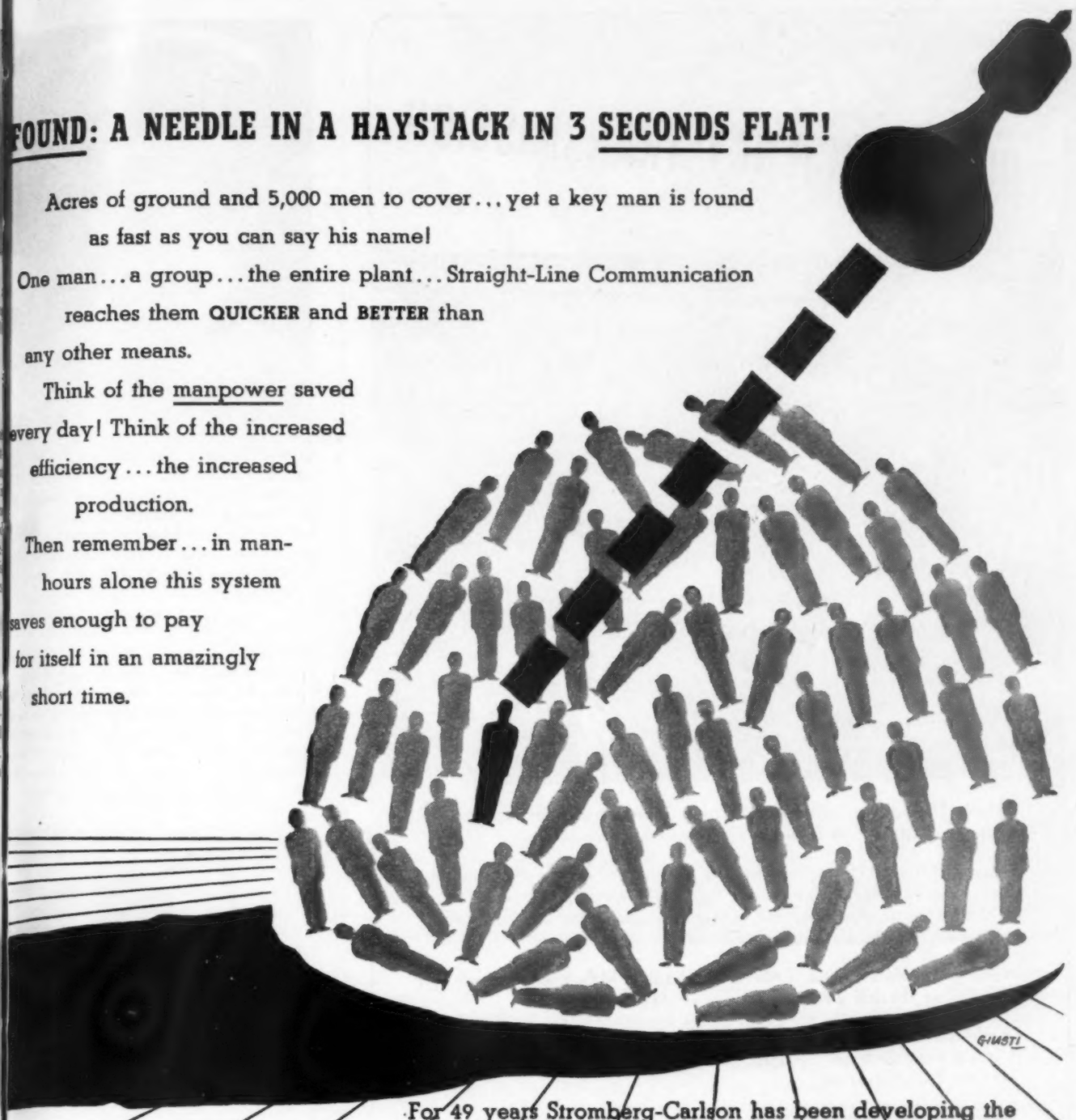
FOUND: A NEEDLE IN A HAYSTACK IN 3 SECONDS FLAT!

Acres of ground and 5,000 men to cover... yet a key man is found as fast as you can say his name!

One man... a group... the entire plant... Straight-Line Communication reaches them **QUICKER** and **BETTER** than any other means.

Think of the manpower saved every day! Think of the increased efficiency... the increased production.

Then remember... in man-hours alone this system saves enough to pay for itself in an amazingly short time.



For 49 years Stromberg-Carlson has been developing the finest type of sound reproducing equipment. Today this equipment is playing a vital role in speeding plant production all over the country.

If you have any communication problem that needs solving... why not get in touch with the Sound Systems Division of the Stromberg-Carlson Company, 100 Carlson Road, Rochester, New York. Write for free Booklet No. 1936.

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STRAIGHT-LINE COMMUNICATION SAVES MANPOWER • SPEEDS THE WORK TO VICTORY

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HIGH-EFFICIENCY TRANSMISSION

TANNATE leather belting is helping increase the production of present equipment in thousands of important places.

Because TANNATE leather belting retains its great strength and grip even under varying load conditions—assuring continuous machine speeds. And TANNATE is treated to withstand heat, moisture, many chemicals and machine oils.

When properly installed, TANNATE requires little maintenance and will stay on the job 24 hours a day—7 days a week.

Leather is doing vitally essential work. Protect what you have, give it good maintenance. Adjust tensions, keep clean, apply Rhoads Tannate Belt Preserver.

STEP UP PRODUCTION with
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air is introduced into the helmet. Accord ing to the maker, there is no draft o the face or head. Three to five pounds air from any respirator line is claime ample for satisfactory operation. Th attachment weighs 3½ ounces. W. H Kitchen Co., 1107 Second Ave., Seattl

Inspection Light

Dust-tight inspection light is essentiall a magnifying lens with auxiliary lighting designed for use in ordnance plants where open units are not acceptable. The unit consists of a steel housing 12⅝ inches in diameter and 2 inches deep, and is fur nished with a white reflecting surface in side. Outside surfaces are finished in

crackled gray. The magnifying lens is the double convex type, 4½ inches in diameter. Shatterproof cover glass is light sanded for diffusion except for a 3¼-in. clear spot directly under the lens. Swivel base and movable arm permit adjustment of the unit. A cylindrical shield to reduce reflections on upper surfaces of the lens is available. Curtis Lighting, Inc., 6135 W. 65th St., Chicago.

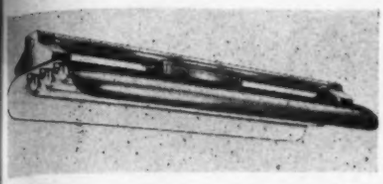
Feeding Machine

A sense of touch is all that is needed to operate this safe semi-automatic feeding machine, according to the maker. Made in many sizes, the machine will feed material to any press up to 200-ton capacity. A mechanical arm places material under die, and a mechanical brain checks against fouled dies, tripping the press automatically when safe. There is no

necessity to change dies on the feeder. Claimed excellent for secondary drawing operations. Heyman Co., 145 Hudson St., New York.

Fluorescent Fixtures

War Model Day-Line fluorescent industrial fixtures have been designed in compliance with the latest WPB steel-limitation order. The wiring channel and end boxes which incorporate the socket saddles are of steel, welded together for sturdy construction. Non-metallic reflectors and channel covers are finished in baked enamel.



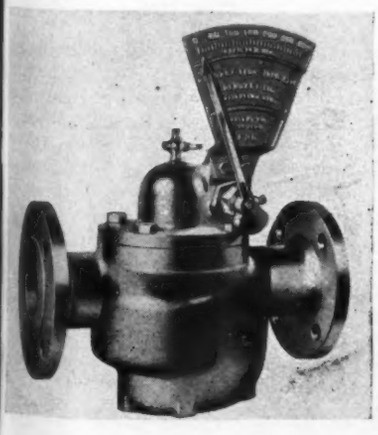
Reflectors are held in place by two wing-type latches which are permanently attached and do not require tools for operation. Ballasts are mounted below the channel. Lamp starters are located behind the sockets, and are replaceable without disturbing the lamps. Fixtures are listed as single units for two 40-, three 40-, and two 100-watt lamps. Couplings are available for making continuous installations. Complete line of accessories makes units adaptable for surface or suspension mounting. DayBrite Lighting, Inc., 5411 Bulwer Ave., St. Louis.

Cleaner

Fast-action cleaner, Formula SC-49, requires no rinsing, will not leave a dust film, and is non-abrasive according to the makers. Claimed economical, it is used industrially for cleaning floors, painted surfaces, walls, and glass. Will not irritate the skin. Sugar Beet Products Co., Saginaw, W. S., Mich.

Indicator

Developed to indicate the rate of flow of hot dirty water, flow indicator is also adaptable for other free flowing liquids. Claimed to register within 3 percent of absolute accuracy, the indicator shows flow over its entire range from zero to 100 percent flow. Graduations on the dial are



. . Standard Conveyor Engineers Will Be Ready — With Added "Know-How" to Their 35-Year Experience Record—For Conveyor Jobs to Come

The experience record of the Standard Conveyor organization spans a period which includes two world wars.

For more than 35 years Standard Conveyor Company has concentrated on power and gravity conveyors. Such specialization has developed improved design and materials in the conveyors themselves and given Standard Conveyor engineers an invaluable reservoir of practical experience.

Knowing how to apply power and gravity conveyors to best advantage is equally as important as building them well. Its service record with American business and industry attests Standard Conveyor Company's ability to do both.

Write for valuable reference book, "Conveyors by Standard" Catalog FM-7

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★ ENGINEERED FOR FASTER PRODUCTION ★

POINTS *to Remember about..*

CHAMPION *Lamps*

1. **Champion Quality**—backed by forty-three years of specialization and guaranteed to equal or exceed Federal Specifications.

2. **Champion Service**—Fluorescent and Incandescent Types. Experts at strategic points ready to help on any lamp or lighting problem.

3. **Champion Economy**—lower light and lamp costs than those of other lamps of equal quality.

4. **Champion Distribution**—through qualified local suppliers equipped to meet emergency needs efficiently and intelligently.

Good light and plenty of it has proved a key factor in sustaining both the quality and quantity of American war production. The makers of CHAMPION Fluorescent and Incandescent Lamps are doing their utmost to maintain the supply of lamps worthy of this great responsibility.

Since 1900

CHAMPION LAMP WORKS

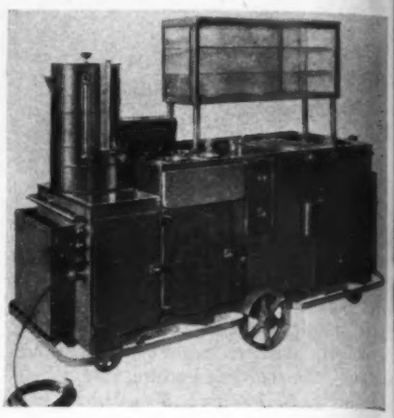
Lynn, Massachusetts

A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

uniformly spaced, and indication is "gallons per minute." When no water is flowing the plunger rests on its seat, and the openings through the meter are entirely closed. There are only three moving parts which are interchangeable with stock parts. Henszey Co., Watertown, Wis.

Mobile Canteen

For lunch or snack service any time, any place, cafeteria on wheels can be operated and moved by one person. It can serve approximately 150 people with assorted hot and cold foods, sandwiches, desserts, and



drinks in short order. After pre-heating, the insulated heat storage unit will keep food at serving temperature for three hours. The glass-lined urn may be used for beverages. Continental Refrigerators Corp., 95 Madison Ave., New York.

Wetting Agent

Kleen-Kol, when added in minute quantities to coal-spraying water, is claimed to produce rapid dispersion of the liquid over and throughout the coal pile, wetting and precipating dust particles where water alone would be ineffective. Less than 1 percent moisture is added to the coal. A siphon attachment is available for standard ¾-in. hose to feed the concentrate into the hose stream in the recommended dilution. Also allays coke and ash dust. Kleen-Kol contains no calcium chloride, and is claimed non-toxic, non-flammable, and non-corrosive to metals; odorless; and harmless to skin, rubber, and composition belting. Sterling E. Norcross, 35 Walnut St., Bloomfield, N. J.

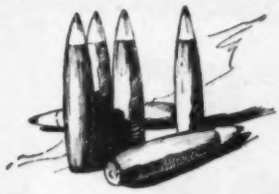
Heater

Self-contained, self-powered heater is announced as a portable source of heat to be used wherever auxiliary or temporary heat is required. Is direct fired, and available in model using gasoline for engine and heater fuel, or in model using gasoline for engine fuel and No. 2 fuel oil as heater fuel. A small gasoline engine drives pressure-type propeller fan which blows air over the combustion chamber and out through two openings. Engine also drives small centrifugal fan which provides air for combustion. Models available with various systems of collapsible, canvas duct-work, the ducts being used to convey heated air to location desired. Unit is

PARTS FOR — AIRCRAFT

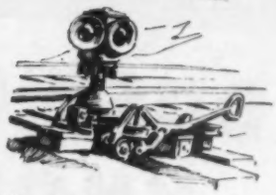
Tail wheel assemblies, actuating cylinders and engine forgings. Brake lining. Camshaft and starter bearings.

PARTS FOR — BATTLE



Shell and shot forgings. Cast bomb parts. Steel armor plate castings. Ammunition hoists. Torpedo parts.

PARTS FOR — TRACKWORK



Crossings, switch stands, switch point locks, guard rails, rail lubricators. Trackwork for industrial equipment.

You Name the Part —

PROBABLY WE MAKE IT

Brake Shoe **MAKES PARTS** for original equipment and for maintenance; parts that are upset and drop forged; molded fabrics and plastics; ferrous and non-ferrous castings. In war, as in peace, Brake Shoe ships millions of parts to thousands of manufacturers, in many fields of industry.

The services of our research and development engineers are available for immediate or post-war problems.

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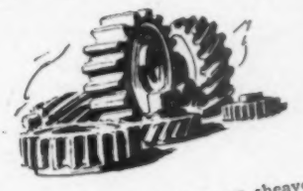
58 PLANTS SERVING INDUSTRY AND TRANSPORTATION

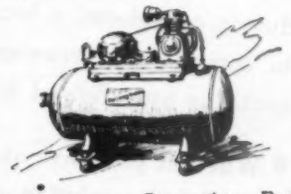
American Brakeblok Division	*Detroit, Mich.*
Ramapo Ajax Division	*New York City*
American Manganese Steel Division	*Chicago Heights, Ill.*
Brake Shoe and Castings Division	*New York City*
Kellogg Division	*Rochester, N. Y.*
American Forge Division	*Chicago, Ill.*
Southern Wheel Division	*New York City*
National Bearing Metals Corp.	*St. Louis, Mo.*

PARTS FOR — MANUFACTURERS



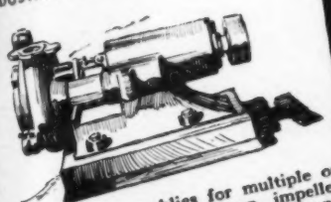
Manganese steel chain, gears, sheaves, sprockets and wheels. Hard surfacing welding rods. Forgings, castings.

PARTS FOR — GARAGES



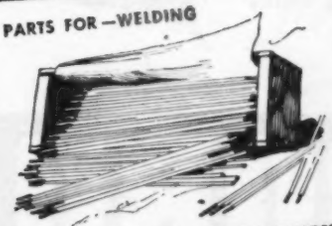
Air compressors. Car washers. Brake lining, fan belts, clutch facing, radiator hose, auto lifts.

INDUSTRIAL PUMPS



Complete assemblies for multiple or two van closed or open impeller type. Single stage self-priming pumps.

PARTS FOR — WELDING



Welding rods, flux, nickel-manganese filler, applicator bars. Welding products for repair of ferrous equipment.

PARTS FOR — SHIPS

Strut and stern tube bearings. Carbon steel castings for davits and winches. Bronze castings for engines.

"DUST CONTROL KNOW HOW"

• The "Dust Control Know How" of Pangborn Corporation is intelligently correlated and compiled in new Bulletin No. 909 which is a complete digest of thirty-five years' *experience* and *progress* in the Control of Industrial Dust. Based on the conviction that no dust problem is too large or too small for efficient, economical solution, this bulletin treats the subject in all its phases and vividly illustrates the advantages and possibilities of *Modern* Dust Control.

• Alert, thinking industrialists have discovered that dust control is no longer confined to those few industries where dust is considered a health hazard. They have now learned to compute the economic handicap in plants where dust particles are allowed to roam uncontrolled.

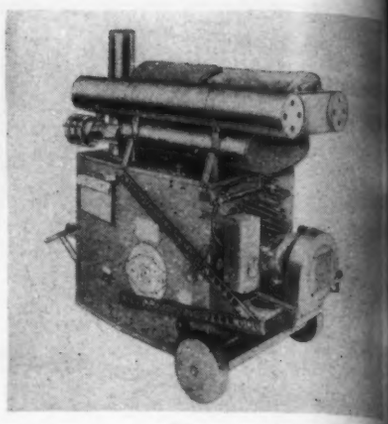
• Whether *you* have an immediate need or a post-war possibility for the solution of a dust problem, you should read Bulletin No. 909 *now,* for it will show you what can be done at a relatively insignificant cost. Included are concise, factual reports on specific instances of dollars and cents effects of dust control. These are the kind of figures in which you are interested for they give actual proof not only of the advisability but also of the direct need for *correct, modern dust control.* Write today for your copy of Bulletin No. 909.

ARMY E NAVY

PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION • HAGERSTOWN, MD.



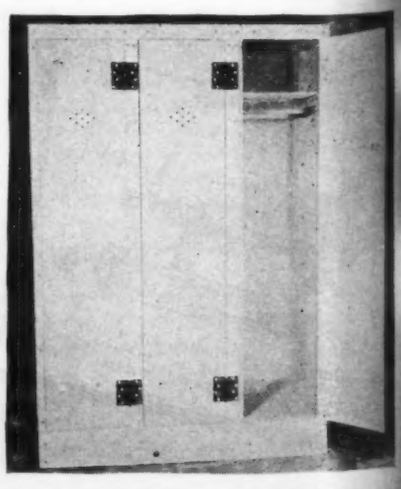
equipped with two retractable wheels. Heating capacity is 250,000 B.t.u. per hour at 60-deg. inlet. Discharge at ½-in. water gage pressure is 2000 c.f.m. Herman Nelson Corp., Moline, Ill.

Metal Cutting Oils

Oils recommended for use on practically all metals for cutting and machining operations have been developed from readily available raw materials. Vegicut A and Vegicut B, low and medium viscosity oils; Vegisol, an emulsifying cutting oil soluble in a wide range of waters; and Vegisulph, a sulphurized product providing anti-welding protection form the new group. Increased oiliness, good wetting and cooling ability, and resistance to rust, corrosion, oxidation, and rancidity are claimed. A specially developed surface active synthetic is said to effect a displacement of water film on metal surfaces in all but the emulsifying oil, Vegisol. National Oil Products Co., Harrison, N. J.

Asbestos-Cement Sheathing

Flat sheathing, made by combining Portland cement and asbestos fibers under pressure, is being offered as a metal substitute for building lockers. The material is a stone-like substance which will not rot or corrode, and is claimed fireproof and rodent-proof. Available in 48x96-in. sheets, ⅜-in. thickness. Is recommended for locker construction. Can be easily made up by a carpenter according to the



FIRST OF THE TOOLS THAT SHAPE WAR'S WEAPONS

CABLE ADDRESS "ATKINSAW"

GENERAL OFFICES AND FACTORY
INDIANAPOLIS IND. U. S. A.
IN CANADA
SHURLY-DIETRICH-ATKINS CO., LTD
GALT, ONTARIO
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E.C.ATKINS AND COMPANY

SHEFFIELD SAW WORKS

SILVER STEEL SAWS

420 SOUTH ILLINOIS ST.

INDIANAPOLIS, IND., U.S.A.

A Report on
The Battle of Production

Gentlemen:

In almost the same sense that a private soldier is "enlisted", E. C. Atkins and Company have enlisted in World War II as a production force. Our fundamental aim is to do that in which we are thoroughly trained, at such a peak level as to aid materially the conduct of the war.

Continually, Atkins Engineers, carrying with them years of technical and practical experience, are contacting and making available their service to many concerns now engaged in the manufacture of essential war materials.

There is scarcely a weapon, machine or instrument of war whose production does not in some manner or form require the use of Saws or saw making technique. Some require numerous cutting operations. We are doing our part in keeping these Saws on the job to perform more efficiently than ever...not only to give longer service, but also to increase the speed and quality of operation. These Saws are in operation on our home fronts as well as in the bombed or transplanted factory areas of our Allies, in England and Russia.

The war attitude of E. C. Atkins and Company is one of patriotism, and we have gladly devoted our best efforts to our Country's program. Our financial resources and our organization are pledged to see it through to the only conceivable end — Victory.

Very truly yours,
E. C. ATKINS AND COMPANY

J. C. Atkins.

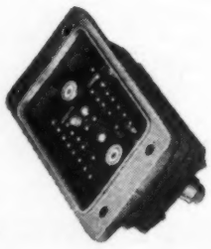
E. C. Atkins
President

and FIRST IN THE PURSUITS OF PEACE

IF there ever was a fisherman's fantasia . . . this is it! With his portable refrigerating set, our post-war Isaac Walton is catching 'em . . . and in a twinkling they're on ice . . . or should we say . . . *in* ice.

We expect some wonderful things from the science of electronics. Maybe the fish won't be frozen—but other marvels are certain.

Whatever new products appear in future peacetime years, if they use electrical circuits and are made to the highest order of specifications . . . you'll probably find Cannon Connectors playing a vital part in their operation.



Composite self-aligning connector for rack type "plug-in" radio equipment, used in America's fighting planes. Scores of industries, including aeronautics, radio, television, sound apparatus, shipping, lumber and railroads use Cannon Connectors. In products and industries where dependability must be 100% and where quick, effective electrical connections must be made, you will find Cannon Connectors.

CANNON ELECTRIC

CANNON ELECTRIC

Cannon Electric Development Co., Los Angeles, Calif.

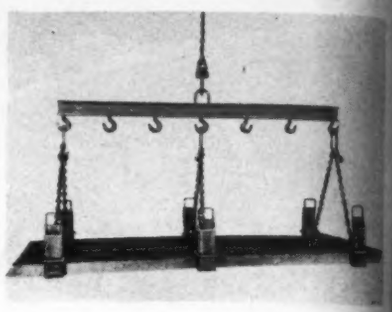
Canadian Factory and Engineering Office: Cannon Electric Co., Ltd., Toronto

REPRESENTATIVES IN PRINCIPAL CITIES—CONSULT YOUR LOCAL TELEPHONE BOOK

manufacturer. Philip Carey Mfg. Co., Asbestos-Cement Products Dept., Lockland, Cincinnati.

Grab

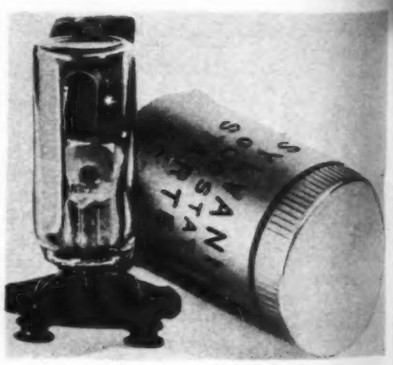
Sheet-steel grab handles short or long flexible bundles without slippage or distortion of stock, according to the manufacturer. A single grab is used for short bundles; two grabs hooked to a supporting beam for medium bundles; three grabs



for longer bundles. Supporting beam is 6 feet long. Lifting capacity ranges up to 3 tons, or 1 ton per sling. Sizes of bundles may vary from 18 to 48 inches in width, up to 9 inches in thickness, and be of any length. Grab hook takes up chain slack when low headroom requires. Heavily constructed, the unit weighs about 190 pounds. Palmer-Shile Co., 7110 W. Jefferson Ave., Detroit.

Fluorescent Starter

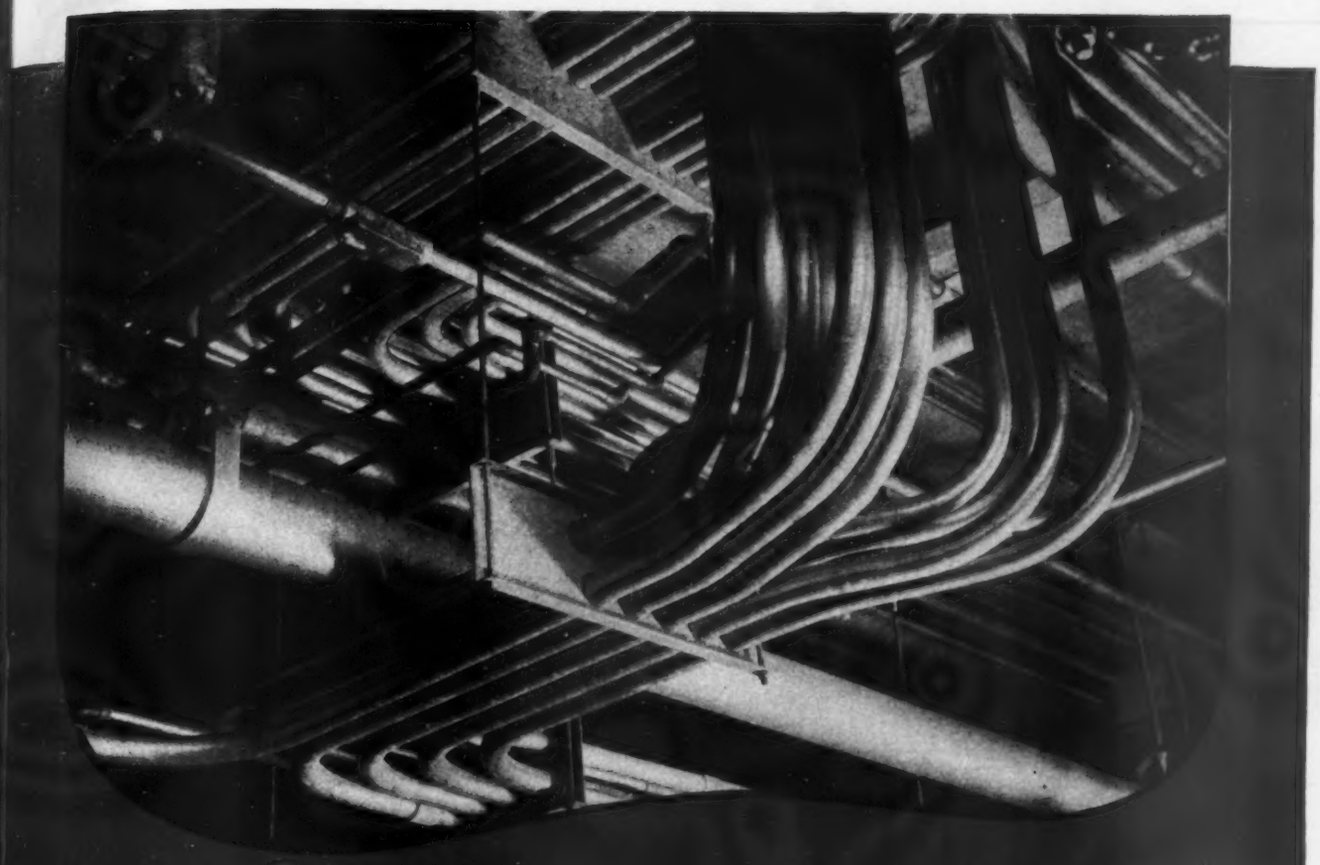
A glow-type starter, designated as Glostat, has been introduced. According to the manufacturer the starter will take severe punishment from a failed lamp and will



give long service. The Glostat is available in two sizes, FS-2 for 15- and 20-watt lamps, and FS-4 for 30- and 40-watt lamps. Sylvania Electric Products, Inc., Lighting Div., Salem, Mass.

Inspection Instrument

Combining two-tube fluorescent "daylighting" with single or double 5-in. magnifying lens, the Inspector is for use in inspection work during and after production, in reading small detail, in checking accuracy of regrinding, and many other jobs calling for close examination. Model 1234-W5 has a single lens. Model 1234-W55 has a second lens mounted on a swivel panel for one or two lens magnifica-



Aluminum Conduit

sound as the day it was installed

The electrical conduit you see in this picture carries important power and control circuits in a sewage treatment plant. Conditions there are conducive to corrosion, but this conduit is "good as new" after seven years of service. No rusting to destroy the conduit or cause trouble with the wiring.

Of course, you can't buy Alcoa tubing for conduit today, although tons of tubing are being made. It's all going into airplanes and other fighting equipment. But the splendid performance of prewar installations suggests that aluminum tubing may be a "must" for those postwar jobs where corrosion is likely to be a problem.

Light in weight, aluminum conduit places less burden on its supports. It is easy to fabricate and install. Fittings will become available as soon as metal is released for peacetime projects. These advantages, added to its long, trouble-free life, make Alcoa Aluminum tubing a most economical material to use.

As you draw up plans for postwar construction, you should be considering the advantages offered by aluminum conduit and other Alcoa Aluminum products. We'll gladly send you any data you need. Write ALUMINUM COMPANY OF AMERICA, 2126 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

HOW BIG

can an Air Express shipment be?

AS TO WEIGHT, your shipment may be a pound or a ton and up, so long as it fits in a plane. **AS TO SIZE,** you will be safe in following dimensions shown underneath the illustration.

However, large shipments can often be broken into a number of smaller units. When this is impossible, consult your local Railway Express Agency, who can often make special arrangements for handling larger shipments.

FOR FASTEST DELIVERY, ship early, as soon as package is ready. PACK COMPACTLY but securely, to cut AIR EXPRESS costs.

Maximum dimensions for AIR EXPRESS *packages: Length, 35 to 49½ inches; width, 44 inches; depth, 18½ inches. Break larger shipments into smaller units whenever possible.*

Air Express Speeds War Program

TODAY, AIR EXPRESS not only serves the home front but is also working hand in hand with the Army and Navy to supply our fighting fronts throughout the world.

TOMORROW, AIR EXPRESS will girdle the globe in international peacetime commerce . . . to bring *all* foreign markets to the doorstep of American business.

AIR EXPRESS
Gets there FIRST

Phone RAILWAY EXPRESS AGENCY, AIR EXPRESS DIVISION
Representing the AIRLINES of the United States

WRITE for our quick-reference handbook on "How to Ship by AIR EXPRESS During Wartime." Dept. PR-2, Railway Express Agency, 230 Park Avenue, N.Y.C.

tion. A tempered glass face shield to keep oil and grit off lenses and tubes is also available. The bracket is fully adjustable. Floor models and special models are furnished. Larrimore Sales Co., P. O. Box 1234, St. Louis.

Ventilator

The Volocitrol has been designed to provide noiseless, positive, and adjustable control of air volume, pressure, and distribution across a supply outlet. The frame is

of 16-gage steel, 2⅛ inches wide. Pivoted louvers are of 24-gage steel. Friction pins on each louver permit setting by hand, and positions are maintained when set. A fireproofed felt edging strip to fit between the frame and duct is furnished as standard. Barber-Colman Co., Rockford, Ill.

Plywood Tubing

Plytube, "light enough to float on water and strong enough to hold up a building," is made from wood and plastics. It can be made tapered and square as well as in the ordinary round lengths of tubing. Diameters run from ¼ inch to 2 feet, and any reasonable length can be produced. Wall thickness is a question of extra layers. Veneers used run down to 0.01 inch. According to the maker, Plytube is made in such a way that stress in any direction will push against the length of the grain

P&H Zip-Lift HOISTS

No, Miss Victory, it wasn't!

You're one of thousands of women workers who'll never know the drudgery of old-fashioned materials handling methods—the fatiguing work this job formerly involved. Your Zip-Lift Hoist was installed to provide the simplest, safest way of lifting heavy parts on and off machine tools. Without it, this would be a back-breaking job—that's sure!

As more and more inexperienced men and women take their places in industry, management is providing a practical way to reduce basic training, to lessen fatigue, and speed production through simpler handling with the P&H Zip-Lift—the only small hoist with full magnetic push-button control. Write for literature.

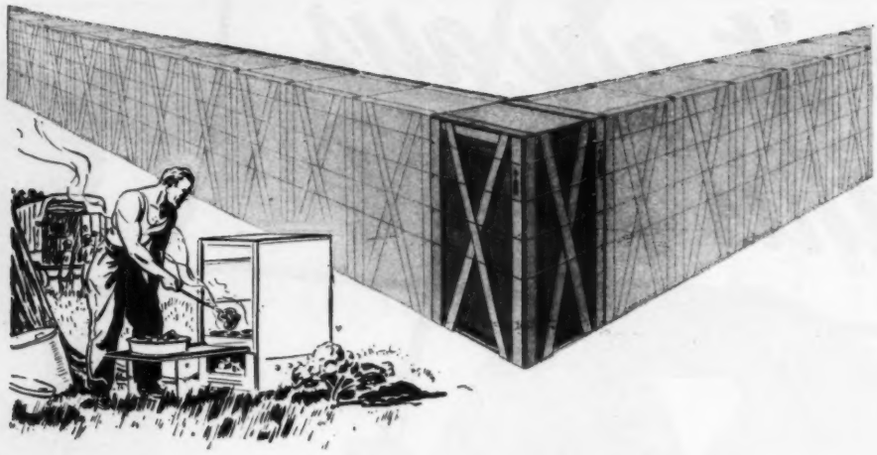
Available in 250, 500, 1000 and 2000 lbs. capacities. Plugs in on any standard lighting circuit.

ARMY E NAVY

A new star has been added to P&H's award for excellence in war production.

General Offices: 4525 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER
CORPORATION
HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS



SAFE TRANSPORTATION

FOR A *Field Range*

STOVES for army field kitchens are now being shipped safely and without delay in General Crates. These strong, durable containers are designed to meet the tough handling conditions necessitated by war's speed-up requirements.

Stoves and other vital war shipments are reaching the fighting fronts and the production home fronts in General Boxes and Crates. As a result General Box engineers have acquired extensive experience in helping shippers meet Federal Packing Specifications. Working in close co-operation with many manufacturers in many industries, they have designed and manufactured containers for a wide range of war products. They are thoroughly familiar with *all* shipping container requirements.

Why not investigate today? General Box engineers will be glad to help you with your shipping problem—help you determine which of the allowable alternates is most practical for your products. Write us.

For manufacturers of war products: ***General Heavy Duty Wire-Bound and Nailed Wooden*** **BOXES** ***and*** **CRATES**
Where availability of materials permits: ***Corrugated*** **BOXES** ***and Wood Cleated Fibreboard***
CONTAINERS, ***Generalite and Nailed Strapped*** **BEVERAGE CASES** ***for Domestic Service***

GENERAL BOX COMPANY

GENERAL OFFICES: 504 N. Dearborn Street, Chicago, Illinois
DISTRICT OFFICES AND PLANTS: Brooklyn, Cincinnati, Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, New Orleans, Sheboygan, Winchendon; Continental Box Company, Inc.: Houston, Dallas.

of a column of wood. Radial pressure of crushing is counteracted by veneers running in one direction. Axial bending along the length is resisted by other veneers and twisting or torsional stress is taken care of by a third line of veneers. The tubing is made in a continuous spiral or other method so that inside and outside surfaces are smooth. Tolerances can be kept within 0.005 inch. International hydrostatic pressure resistance compares favorably with that of metal. Tubing can be furnished for threading on the job with ordinary pipe dies, and can be cut with woodworking machinery. Internal or external sleeve joints and various arrangements of telescoping parts are available. By coating the tubing with sealer or other finishes it can be used to carry chemicals. Plymold Corp., Lawrence, Mass.

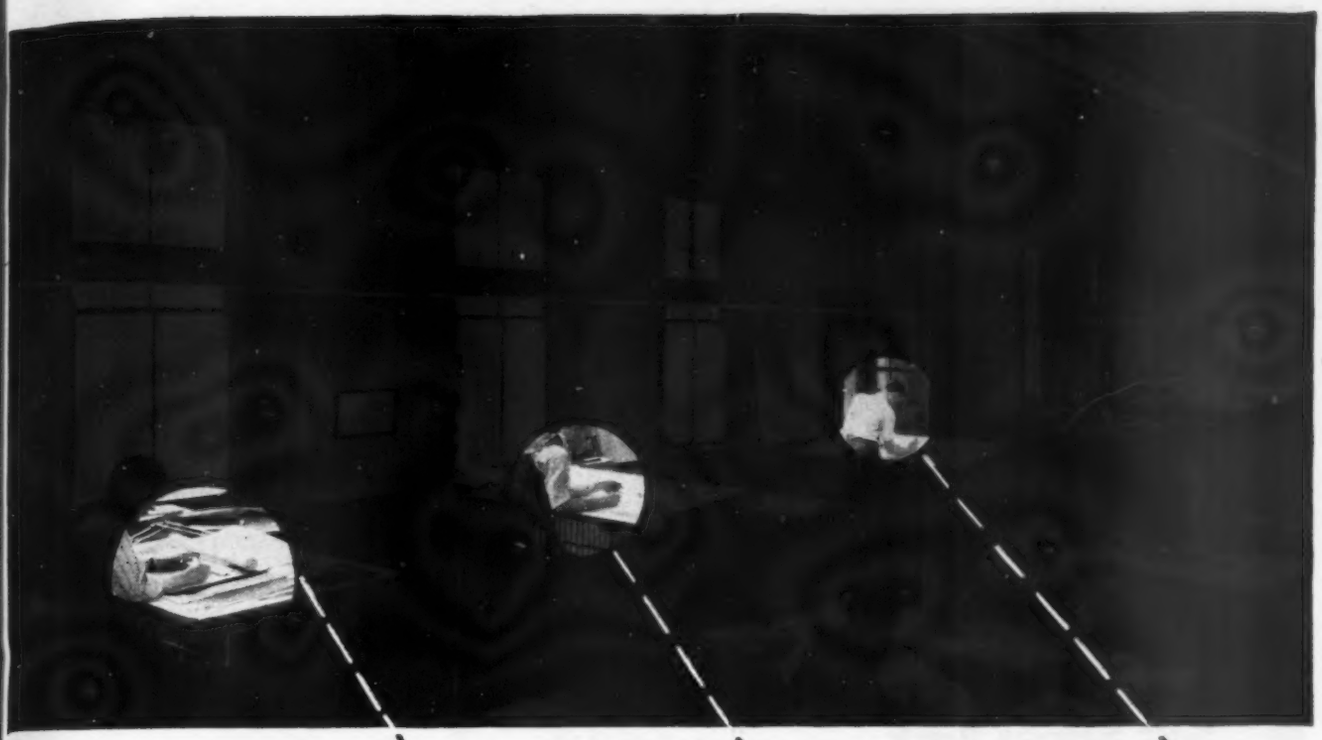
Arc Welders

Line of a.c. arc welders for industrial service is being made in seven heavy-duty and four intermittent-duty models with a range of capacities for handling production welding under continuous operation. Specific WSR ratings of heavy-duty models are: 50 to 270, 60 to 375, 90 to 500, 100 to 625, 125 to 750, 150 to 900, and 200

to 1200 amperes. Intermittent-duty model ratings are: 20 to 185, 20 to 235, 20 to 285, and 20 355 amperes. Setting and control of current throughout complete welding service range involves one simple adjustment. Operating efficiency up to 95 percent is claimed, Harnischfeger Corp., Welder Div., Milwaukee.

Thermometer

One-piece industrial thermometer has a shallow case which makes it possible to see the mercury column through a wider angle of vision. The chromium-plated bezel fits into the grooved case in such a way as to hold the glass front against four wavy tension springs fastened under the scale by shakeproof screws. This construction is claimed to make the thermometer dustproof, rattleproof, and practically fumeproof. Furnished in many combinations of straight and angle stems,



DUST and FUME CONTROL is a job for . . .

ENGINEERING SPECIALISTS

An efficient dust or fume control system is a combination of various mechanical units, each of which is the *right* unit for the specific job to be done. Selection of the most efficient units for each kind and condition of dust and air is highly important—and highly difficult. It is decidedly a job for engineering specialists.

The Kirk & Blum Engineering Staff, qualified by over 36 years of experience in this particular field, first makes a thorough analysis of your special dust or fume control problem. Next, our Staff selects the right units for *your job* from among the various makes available —then designs and installs a complete system that is *guaranteed* by Kirk & Blum to give the results you want.

Don't take chances with a "half-way" dust or fume control system. Don't risk being "sold" on a unit or units that may not be right for your individual job. Get the unbiased counsel and planning of experts—Kirk & Blum Engineers.

For details write to The Kirk & Blum Manufacturing Co., 2835 Spring Grove Avenue, Cincinnati, Ohio.

Dry products and clean air required; cloth filter selected.

Wet process air cleaning using ROTO-CLONE.

Centrifugal separator suitable for heavy dust concentration.

KIRK AND BLUM

AN ORGANIZATION OF ENGINEERS AND MECHANICS.

Salt Brings Back That Will To Work

Heat-Fag is an ever-lurking enemy in every shop where toil and sweat are writing new production records. Body salt lost by sweating must be replaced or Heat-Fag sets in. Lowered vitality, fatigue, production slowdowns, accidents and absenteeism can often be laid at the door of this insidious force.

The finger of Accidents is always beckoning to the fatigued, inalert worker. That's why Heat-Fag, ever present when men sweat, takes such a heavy toll in man-hours lost.

Salt tablets restore the body salt lost through sweating. They help keep men alert . . . efficient.

In leading industrial plants, salt tablets are a "must" for men who sweat. They maintain the will to work through long, hard, hot hours.

This Is What Happens When Sweating Robs the Body of Salt . . .

MORTON'S Heat-Fag SALT TABLETS

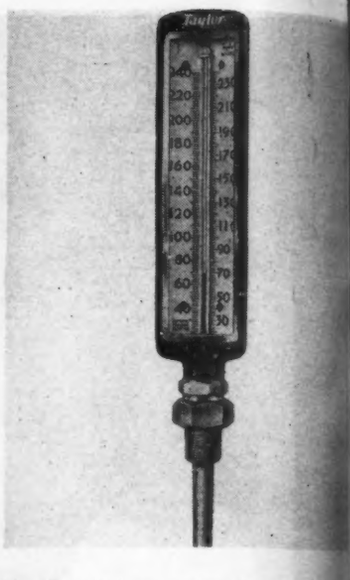
QUICK DISSOLVING
(Less than 30 seconds)
This is how a Morton Salt Tablet looks when magnified. See how soft and porous it is inside. When swallowed with a drink of water, it dissolves in less than 30 seconds

Case of 9000, 10-grain Salt Tablets, $2.60
Salt-Dextrose Tablets case of 9000, $3.15

Place MORTON'S DISPENSERS at all Drinking Fountains.
They deliver salt tablets, one at a time, quickly, cleanly — no waste. Sanitary, easily filled, durable.
500 Tablet size - $3.25
1000 Tablet size - $4.00

Order from your distributor or directly from this advertisement . . . Write for free folder.

MORTON SALT COMPANY • CHICAGO, ILLINOIS



with threaded or union connection, in standard temperature ranges within the limits of 40 deg. F. below to 750 deg. F. above. Standard scale lengths are 7 to 9 inches. Taylor Instrument Companies, Rochester, N. Y.

Floor Treatment

Stainless, transparent chemical floor treatment in liquid form can be used on wood, cement, marble, tile, or terrazzo, and is claimed to have a peculiar affinity for dust which keeps down floor traffic dirt particles in the air. Called Westone, it is applied to the floor by spraying or mopping. The floor is then maintained by sweeping with a yarn brush. West Disinfecting Co., 42-16 West St., Long Island City, N. Y.

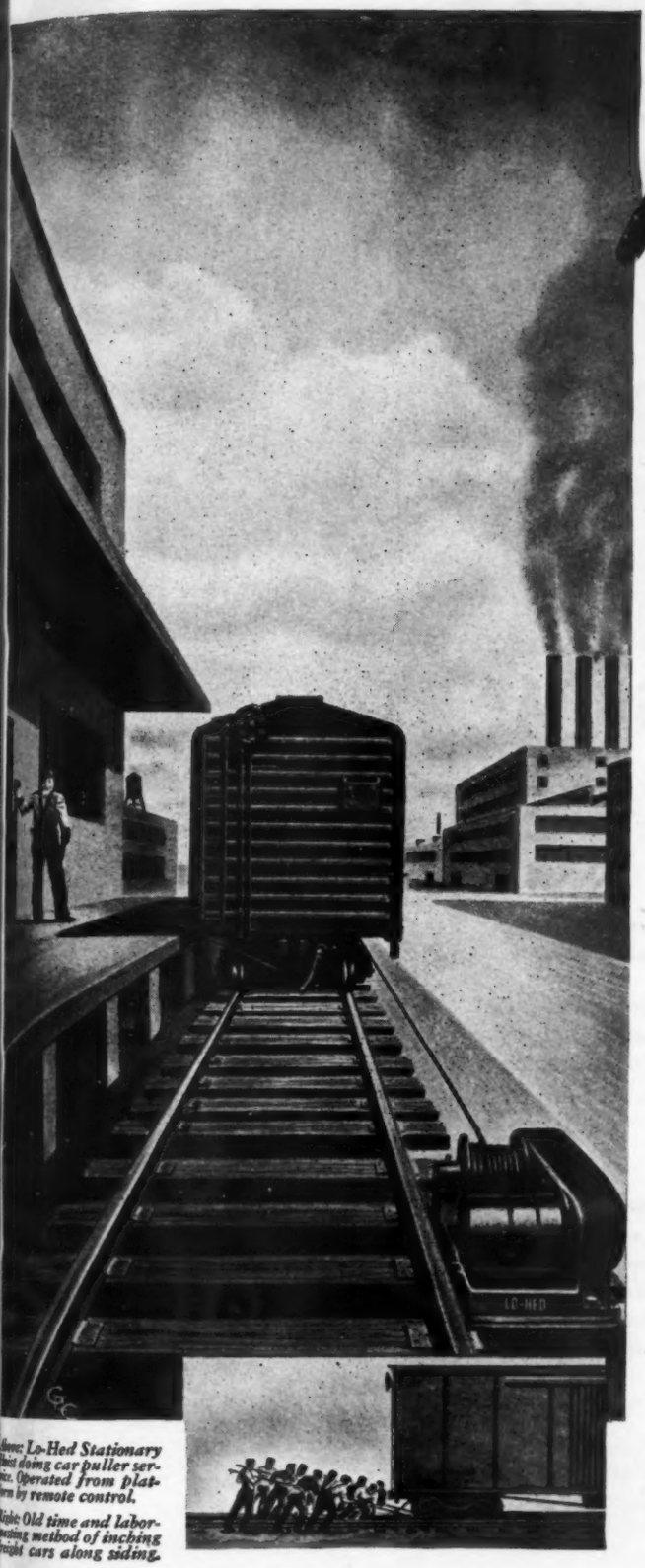
Paint Stick Marker

For use on all cold surfaces, paint stick marker "S" is real paint in stick form, and produces fadeproof, weatherproof markings according to the maker. Fast-drying,

the marker is suitable for layout purposes on steelplates, bare or coated, and makes a wide legible mark. Comes in red, white, blue, green, yellow, or black. Markal Co., 6 E. Lake St., Chicago.

Cleaning Basket

Dunking and dryer basket comes with a standard 5-gal. steel shipping pail which contains cleaning solvent. On withdraw



Above: Lo-Hed Stationary Hoist doing car puller service. Operated from platform by remote control.

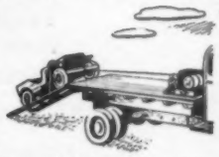
Right: Old time and laborious method of inching freight cars along siding.

I HAVE 101 USES

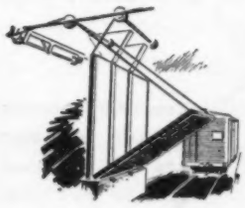
Can I save you Time, Money and Manpower?

The Lo-Hed Stationary Hoist is the hoist-of-all-trades. There is hardly a plant that can't use one or more and for one or more purposes. You can bolt this hoist anywhere—to a floor or foundation; or move it from one job to another.

Its many uses include car puller service at plant sidings or freight yards, hoisting mine cars, handling spouts in steel mills, operating contractors' derricks, lifting heavy gates, furnace doors, vat covers, raising and lowering platforms, pulling loads up inclines and many others.

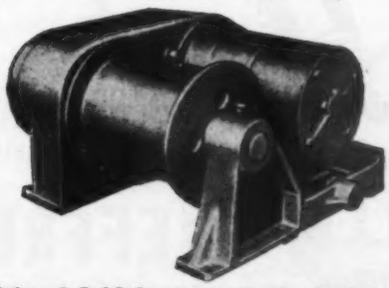


The Lo-Hed Stationary Hoist has a number of the same features you find in Lo-Hed Monorail Electric Hoists, such as an efficient straight line spur gear drive, heavy duty hoist motor, and heavy duty bearings and stub tooth gears operating in a sealed oil bath. Motor, controllers, and gearing are protected from dust and dirt by readily removable covers.



CAPACITIES 500 to 4000 lbs. Standard capacities are available from 500 to 4000 lbs. Holding or lowering brakes, push-button control, outboard winch head and other features can be supplied should the job require them.

Write or telegraph for full information on a Lo-Hed Stationary Hoist to meet your requirements.



Other A-E-CO Products: Taylor Stokers
Marine Deck Auxiliaries • Hele-Shaw-Fluid Power

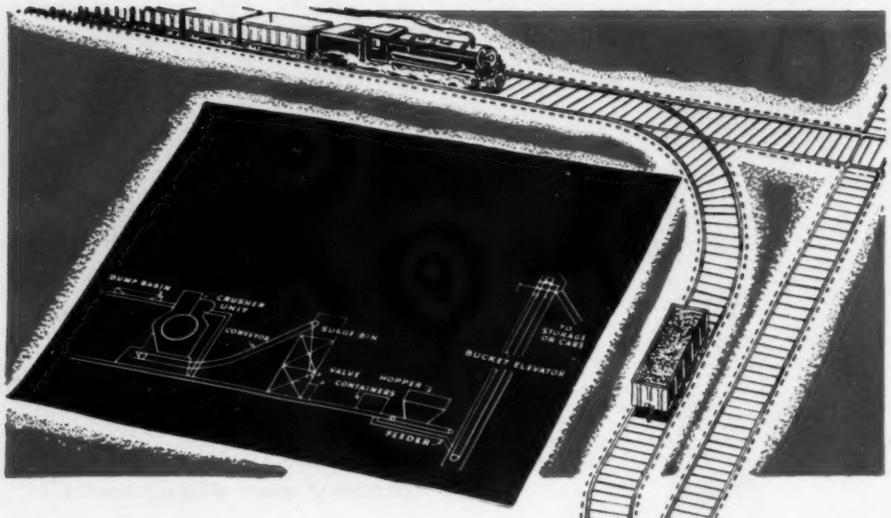
Also, Lo-Hed "Balanced" Electric Hoists for all purposes which can be adapted for operation on any monorail system.

Look in your Classified Telephone Directory under "A-E-CO LO-HED HOISTS" for your nearest representative.

AE CO 75th ANNIVERSARY

AMERICAN ENGINEERING COMPANY

2426 ARAMINGO AVENUE
PHILADELPHIA, PENNA.

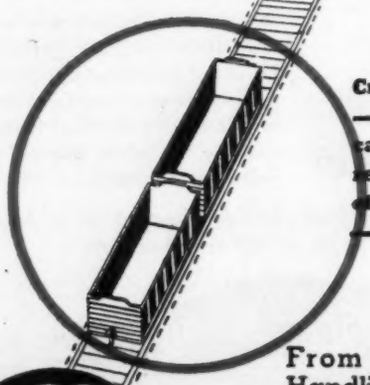


TURN TURNINGS INTO Good SCRAP

Twisted, springy coils of segregated metal turnings are tough to handle, but they must be salvaged. You can

Reduce volume by two-thirds
Reclaim oil and cutting compounds
Handle reduced material automatically

with a complete Jeffrey system, designed specifically for your plant. This system includes: Jeffrey metal turnings crushers, elevators, conveyors, feeders, bins and hoppers.



Crushed turnings save space — why use three cars? One car of reduced metals will release two cars for the war effort — cut your freight bills —increase revenue from scrap.

From the crusher, the Jeffrey Handling System maintains segregation to storage bins or cars.

JEFFREY.... ESTABLISHED 1877

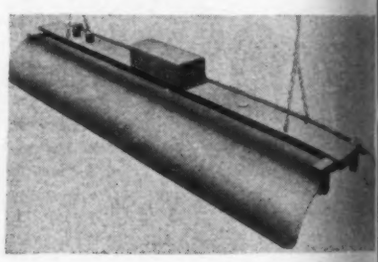
THE JEFFREY MANUFACTURING COMPANY
911-99 North Fourth St., Columbus, Ohio

SALES OFFICES:
Baltimore, Birmingham, Boston, Buffalo, Chicago, Cleveland, Cincinnati, Detroit, Denver, Marion, Houston, Huntington, Milwaukee, New York, Philadelphia, Pittsburgh, Scranton, St. Louis, Salt Lake City

ing the basket from the cleaner, spring-like clips attach themselves to the edge of the container, allowing excess solvent to drain back into the pail. Made entirely from scraps of new metal. Curran Corp., Malden, Mass.

Fluorescent Fixtures

Feature of 5000-Line industrial fluorescent lighting fixtures is the Flexi-Coupler, a device which permits spacing of fixture units as much as 6 inches apart yet retains advantages of continuous-run installation. This makes possible the use



of nine 100-watt fixtures in a 50-foot run instead of ten. Has lightweight channels and non-metallic reflectors with reflection factor of approximately 90 percent. Available in two 40-watt, three 40-watt, and two 100-watt sizes. Martin-Gibson Co., 999 Harper Ave., Detroit.

Drop-Bottom Dump Skid Box

Skid box that can be dumped with standard fork or high-lift power trucks has been developed. The unit consists of an all-steel box, attached to a skid platform with a continuous hinge at one end. Steel plates are welded to the skid at a point equal to the length of the forks on platform on the power trucks to hold the skid in position at the end of the forks. Attached to the top rear of the box are latch rings which are hooked over a plate welded to the truck mast when the unit is being used. In spot dumping, side plates which form a chute keep the contents from spilling. These plates may be extended up to the box top and a crane

GOOD TOOLS ARE PART OF THE PICTURE

On Consolidated Vultee's vast mechanized assembly lines, where famed Liberator bombers and transports move swiftly to completion, Snap-on tools are part of the picture! Their accuracy, speed and power . . . their flexibility and ease of application in difficult places . . . save precious time in countless operations.

Everywhere in the great panorama of America's Production-for-Victory, Snap-on tools play a vital part . . . dependable aids to fast, accurate workmanship in every phase of production, assembly and maintenance. Write for catalog of 3,000 Snap-on tools, and address of nearest Snap-on factory branch.

SNAP-ON TOOLS CORPORATION
8044-G 28th Ave. • KENOSHA, WISCONSIN

Snap-on Tools
THE CHOICE OF BETTER MECHANICS

HEIN-WERNER
HYDRAULIC JACKS
are great for lifting, lowering or pushing machinery or heavy materials

• AVAILABLE
for quick delivery to plants doing war work

- **Super-Powerful**
- **Easy-Operating**
- **All models in H-W line are factory-tested at 1½ times rated capacity**

HERE'S WHY H-W HYDRAULIC JACKS *are easier to operate*
In a split-second, mere finger pressure is transformed into a lifting force of several tons

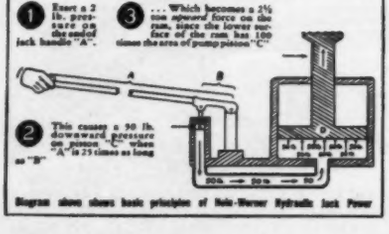


Diagram above shows basic principles of Hein-Werner Hydraulic Jack Power

Our fighting men who conquered the Axis in Africa proved the value of superior equipment. And the explanation at the left brings out one of several reasons why Hein-Werner Hydraulic Jacks are so popular in industrial plants. These proven products are compact, sturdy, safe, fast and *easy to operate.*

The complete H-W line includes jacks of 3, 5, 8, 12, 20 and 30 tons capacity. Ask your industrial supply distributor, or write us for details.

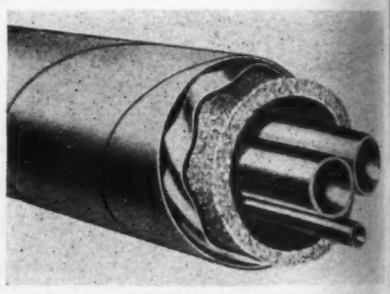
HEIN-WERNER MOTOR PARTS CORP.
Waukesha, Wisconsin

HEIN-WERNER
HYDRAULIC JACKS
Are Built Right and Priced Right

loop welded to each plate, allowing the unit to be handled by crane for transporting or tiering. Union Metal Mfg. Co., Canton, Ohio.

Insulated Conduit

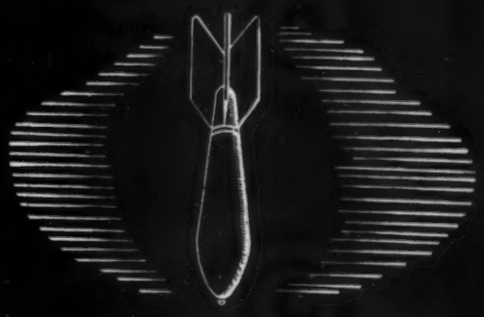
Process liquids can be piped comparatively long distances by insulated conduit system with desired temperatures maintained. For underground or overhead installations, for hot or refrigerated process liquids, any specified combination of pipes can be furnished in a pre-fabricated conduit, with insulation arranged so that pipes are insulated from the exterior, but



not from each other. Conduit is helical corrugated, coated and wrapped with asphalt saturated asbestos felt. Assembled units come in 21-ft. lengths for speedy installation. Prefabricated connecting bands, expansion devices, and accessories for a complete system are included. A tile system, with a diatomaceous earth lining molded and keyed to the inside of the tile, is available for underground installation only. The Ric-wiL Co., Union Commerce Bldg., Cleveland.

Dry-Type Transformers

Series of dry-type natural-draft transformers for indoor use on 600 volts and below has been announced. Lighter and smaller, the transformer requires less floor space. It has a two-legged core with a high- and low-voltage coil on each leg. The core is clamped at top and bottom, the bottom clamps serving as mounting feet and drilled so the transformer may be bolted to the mounting surface. Top clamps are used for lifting the transformer or serve as the upper bracket if unit is wall mounted. The case design permits wall or close mounting with little effect on



Who Wins Wars?

Strangely enough, the average man does! Much as we all detest war the fact is that under its stimulation a nation always develops new products with infinite peacetime applications. To date, scores of fantastic devices have been created for war purposes which one day will contribute mightily to the American Way of Life. Weatherhead is producing at the rate of *millions every day* many products that have peacetime application. Just as we've helped build cars, planes and refrigerators in the past, Weatherhead is well prepared to help you build these new products of tomorrow.

Look Ahead with

Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND, OHIO

Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.

Plants: Cleveland, Columbia City, Ind., Los Angeles
Canada—St. Thomas, Ontario

Speedi-Dri, even when soaked in oil, will not burst into flame. Unlike sawdust, Speedi-Dri is an effective fire-retardant. Blanket the oily floors around your machines with Speedi-Dri and you need never fear the dangers of a flash fire.

But Speedi-Dri does more than control the fire hazard. It provides a non-slip surface, helping to prevent many a falling-accident. Its absorption quality is so great that it will actually draw old oil stains from wood, concrete, or steel floors. It can be spread by hand and easily swept up with a broom. Speedi-Dri costs less per square foot of floor coverage than any other effective method or product.

When you figure the money you save on insurance, cleaning equipment, and labor; the production time you save by reducing accidents; the lift to employe morale that comes from a cleaner, safer shop, Speedi-Dri almost pays for itself!

You'll never believe what this product can do, till you see it with your own eyes. Write for a generous Free Sample. There is only one Speedi-Dri. (If you use water-soluble oils, or if water is also present, ask for Sol-Speedi-Dri.)

SPEEDI·DRI
OIL AND GREASE ABSORBENT

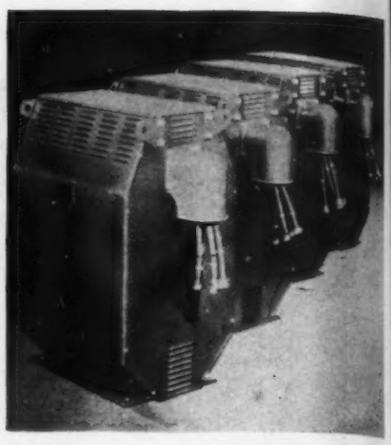
SUPPLIERS

East
REFINERS LUBRICATING CO.
New York City

Midwest and South
WAVERLY PETROLEUM PRODUCTS CO.
Philadelphia, Pa.

West Coast
WAVERLY PETROLEUM PRODUCTS CO.
Menlo Park, Calif.

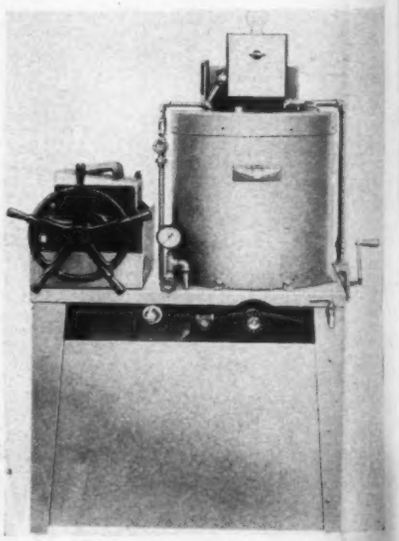
Prompt Service from Warehouse Stocks in Leading Cities



temperature rise. Coils are exposed for maximum cooling with a large portion of their copper outside the core. High- and low-voltage coils are concentric with air ducts between for extra insulation and cooling. Two small coils replace one large coil, resulting in lower exciting current and inrush currents when the primary of the transformer is energized. Case is light-gage steel, and top and side plates are removable. General Electric Co., Schenectady.

Oil Reclaimer

Small capacity lubricating oil reclaimer has been designed to reclaim waste lubricating oils from equipment such as gasoline engines, vacuum pumps, hydraulic machines. Purifies 8 gallons of



dirty oil in 70 to 90 minutes. The machine has a two-state filter press, is semi-automatic, operating under thermostatic control, and utilizes common refinery earths. Built in 8 sizes to handle varying quantities of oil. Youngstown Miller Co., Sandusky, Ohio.

Bearing Puller

Bearing and battery terminal puller called Steelgrip is made in two sizes, 2-in. and 5-in. reach. The arms are drop forged, heat-treated steel. The hooks are thin enough to fit between bearings and motor

You can't accuse an I.B. Crane of Absenteeism!

In shipyards, steel mills, chemical plants and big war plants of every kind all over America, Industrial Brownhoist Cranes are doing steady, heavy work day after day without a letdown. Many I. B. Cranes are operating 24 hours a day. And it is rare indeed when an I. B. Crane has to take time out for repairs. No, you can't successfully accuse I. B. Cranes of absenteeism in this man's war. They're built to stand up—and they are standing up on their job—whenever and wherever it may be!

INDUSTRIAL BROWNHOIST
BUILDS BETTER CRANES
INDUSTRIAL BROWNHOIST CORPORATION, BAY CITY, MICHIGAN • DISTRICT OFFICES: NEW YORK, PHILADELPHIA, PITTSBURGH, CLEVELAND AND CHICAGO

RE-LIGHTING

the new manpower / production *requirement*

HERE'S ONE ANSWER *to this problem...*

This new folder tells the whole story. Send for it!

Because most plants operating today were designed for peacetime, *daylight* working schedules, *their lighting equipment is inadequate for night work!*

The folder illustrated gives one answer to industry's problem of *re-lighting*. Silv-A-King's new fluorescent reflectors of non-critical, metal-saving Silv-A-Tex are durable, efficient, inexpensive, and available for prompt delivery. For complete descriptions and specifications of Silv-A-King "Victory" units, write for a copy of "Catalog 43-V" today!

BRIGHT LIGHT REFLECTOR COMPANY, INC.

1027 Metropolitan Avenue, Brooklyn, N. Y.

SILV-A-KING MAKES *Light* WORK FOR YOU

housings, and long enough to reach the bearing race. Armstrong-Bray & Co., 5364-76 Northwest Highway, Chicago.

Concentrate

Gunk Self-Emulsifier P-96 has been produced to replace petroleum sulfonates. By diluting the concentrate with approximately three volumes of a suitable mineral oil, and extending the soluble oil further with water as needed, stable milky emulsions are produced for cooling and grinding operations. Soluble oils prepared from Gunk are claimed rust inhibiting. Presence of alkyl phenols makes the base non-irritating to the skin. Curtis Corp., Malden, Mass.

Sling

Level-Lift type CSE sling has a special feature which enables the wire rope to equalize itself and lift unbalanced loads level. Made in one size, the sling is claimed simple to use. A single unit handles 3 tons, a double unit handles 6 tons with a safety factor of five. The Level-Lift is recommended for handling long pipes, boxes, steel, and flasks. Macwhyte Co., Kenosha, Wis.

A quick trim for a metal giant

MAMMOTH ingots of steel for war weapons must be "cropped" or trimmed at the ends before forging. Formerly this job was done slowly and laboriously on a heavy press, but today the huge ingots are sliced neatly and quickly by the oxyacetylene flame.

Using a new heavy cutting technique developed by Airco Research Engineers and cutting through metal as thick as 36", the oxyacetylene flame trims off both ends of this ingot at once in approximately 11 minutes, compared to several hours required by other methods. The new ingot cutting machine designed and built by Airco engineers especially for this job guides the movement of the oxyacetylene cutting torches in an arc corresponding to the ingot contour.

This new flame cutting application typifies the ever-expanding usefulness of the oxyacetylene flame in American industry. Spurred by the need for swifter war production, industries are finding more and more ways to accelerate manufacturing with oxyacetylene flame and electric arc processes.

If you work with metals, Air Reduction engineers will be glad to bring you up to date on many recent oxyacetylene flame and electric arc developments. They can assist you in the application of these processes to speed production, save materials and cost. Write your nearest Air Reduction office for full details.

AIR REDUCTION

General Offices:

60 EAST 42nd STREET, NEW YORK 17, N. Y.

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IDLE CYLINDERS ARE PRODUCTION SLACKERS: KEEP 'EM ROLLING FOR VICTORY!

2 STARS YOU CAN STEER BY

In selecting hack saw blades, you can safely "steer by the stars", making sure you see the STAR trade mark which appears on the genuine Clemson-made product

This STAR for SPEEDY SAWING

When the job calls for high speed sawing, call for STAR "Moly"*, the original molybdenum alloy hack saw blade. You can tell it by its copper-color finish, a patented feature.

This STAR for DIFFICULT SAWING

With a STAR Unbreakable Special Flexible, you get a standard alloy blade that cuts like an all-hard, eliminating breakage in use and resisting stripping of teeth. You can tell it by its patented green finish.

CLEMSON BROS.
INCORPORATED
MIDDLETOWN • NEW YORK

*T. M. Reg. — Blades bearing the name "Moly" are made only by Clemson Bros., Inc. and affiliated companies

Makers of STAR Hack Saw Blades, Frames, Band Saws, and Clemson D-17 Lawn Machines

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YOU WANT TO KNOW

more about the items mentioned on this page

Letters to the addresses given will bring information

• "THREE-DIMENSIONAL THINKING" is a bit of philosophical advice in booklet form on thinking, planning, and working with the three dimensions—quality, quantity, and time. The booklet, which is available from the Elastic Stop Nut Corp. of America, 2330 Vauxhall Rd., Union, N. J., shows how one company stands up to mass war production.

IDENTOMETER is an electrical instrument for identifying quickly any ferrous alloy by the use of reference specimens. By bringing an unknown specimen in contact with a known sample, the chemical analysis is automatically indicated on a scale. Metals in any stage of working can be identified according to heats, grades, types, heat treatments, composite types. Manufactured by the American Tubular Elevator Co., Pittsburgh, the machine is distributed by Dravo Corp., Pittsburgh

• MORE THAN 600 standards, 94 of which represent new and revised ones, are included in the 1943 "List of American Standards" issued free by the American Standards Assn., 29 W. 39th St., New York. Listed by subject, standards cover various engineering fields as well as metals and materials, specifications for textile, wood, pulp, and paper industries, and methods of test for finished products. Special sections are devoted to war production standards and to safety standards.

• TRANSPARENT HAMMER, made of a tough synthetic, is claimed not to break or chip, and will not mark aluminum, brass, copper, magnesium, silver, or gold, or give off sparks. According to the maker, R. & R. Plastics, Inc., 347 Madison Ave., New York, the hammer can be used "indefinitely" because a new surface can be filed or sawed down when required. Comes in colors.

• LEAD-SEALED, an improved coating process for steel sheet, is claimed to withstand rust and deterioration under severe exposure. Similar to tinplate in appearance, Lead-Sealed sheet "takes" and "holds" paint and finishes without preparatory treatment or weathering. A low melting temperature makes the coating applicable to sheet that must possess ductility or uniformity of temper. Recommended also for die-forming because it does not crack or peel. Continental Steel Corp., Kokomo, Ind.

• ADHESIVE LABELS are being offered as replacement for WPB restricted decomanias by Avery Adhesives, Third & Omar Sts., Los Angeles. Kum-Kleen self-sticking labels will adhere to any smooth surface, and according to the maker will not peel in extreme heat, cold, humidity or temperature changes. A coat of varnish makes them impervious to salt water. Available in stock or special sizes, shapes and colors.

FUL-VUE safety goggle for women has 6.00 curve clear lenses—deep-curved for extra strength and made from ophthalmic crown glass, optically ground and polished. Toughened by annealing, the lenses are claimed fracture-resistant. Made in 42-mm. eye size with three bridge sizes, 19, 21, and 23 mm. American Optical Co., Southbridge, Mass.

• DEN-TEX is a non-irritating, non-explosive cream for removing lacquer, dopes,

"COMPRESSORS Come Clean"

SOLNUS OILS

End Trouble with Sludge... Double Time Between Changes

Sludge and carbon caused a great deal of trouble with the three compressors in a large ice plant. Results—sluggish operation . . . frequent clean-outs . . . kerosene or gasoline was required to clean compressors properly . . . oil consumption was unreasonably high.

On the advice of a SUN "Doctor of Industry" a switch was made to SOLNUS OILS. At the end of six months' operation a regular inspection revealed that these systems were clean and free from sludge and carbon. The clear film of oil left in the machines was easily wiped off with a rag, without solvents. In the twelve months since switching to SOLNUS OILS, no trouble has developed and time between oil changes has been doubled.

These savings in time, trouble and expense are typical of those experienced in many cold storage and ice plants through the use of SUN LUBRICANTS as recommended by SUN "Doctors of Industry." Let one of these experienced lubrication engineers help to solve *your* problems. Write to . . .

SUN OIL COMPANY · *Philadelphia*

Sun Oil Company, Limited, Toronto, Canada

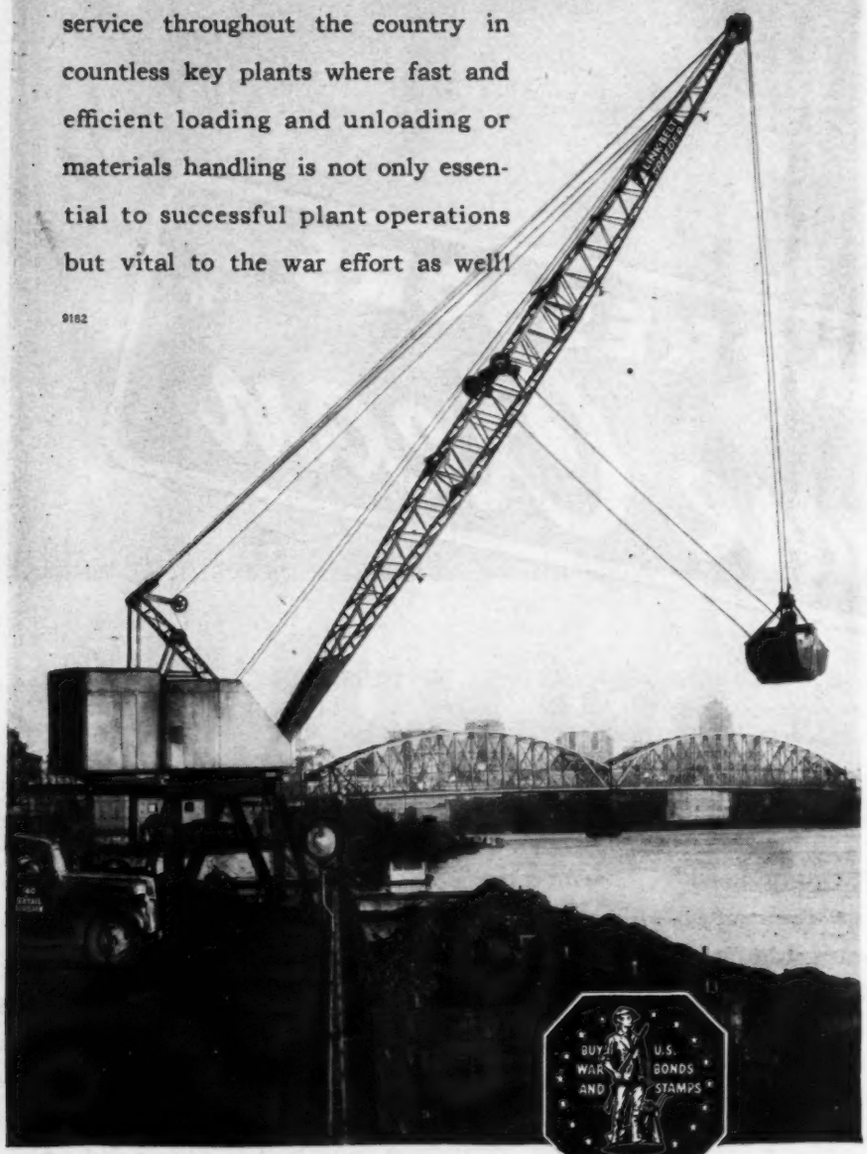
SUNOCO

SUN INDUSTRIAL PRODUCTS *HELPING INDUSTRY HELP AMERICA*

LINK-BELT SPEEDER
A SOLUTION TO LOADING AND UNLOADING PROBLEMS

● No matter what the job or how difficult it may seem—there is a Link-Belt Speeder that will make it easier and more economical to complete. These machines are in service throughout the country in countless key plants where fast and efficient loading and unloading or materials handling is not only essential to successful plant operations but vital to the war effort as well!

9182



LINK-BELT SPEEDER

BUILDERS OF THE MOST COMPLETE LINE OF SHOVELS—CRANES—DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO, ILL.
(A DIVISION OF LINK-BELT COMPANY)

and paints from the hands. It is worked thoroughly into the skin, then rinsed off with water. According to the manufacturer, Dennis Chemical Co., 7... Papin, St. Louis, it leaves the skin soft and clean.

• CHART on approved methods of ... tipping has been issued by the WPB to give at-a-glance information on the apparatus and materials needed and the steps of procedure under different methods of welding and brazing. In a campaign to encourage the tipping of high speed tools the slogan "Tools Are Weapons—Tip 'Em Right" has been adopted. A limited amount of graphic material, including three-color posters, small stickers, and news material for employee magazines, as well as special assistance and data for use in connection with special plant campaigns are being made available from the War Production Board, Washington, D. C.

• MANPOWER REVIEW, containing articles by leading men of the manpower program, is planned and edited in the War Manpower Commission, Bureau of Program Planning and Review, Labor Market Division. Topics of discussion are manpower problems of moment. Single copies at 10c. each, or a yearly subscription at $1 in the United States, Canada and Mexico, may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

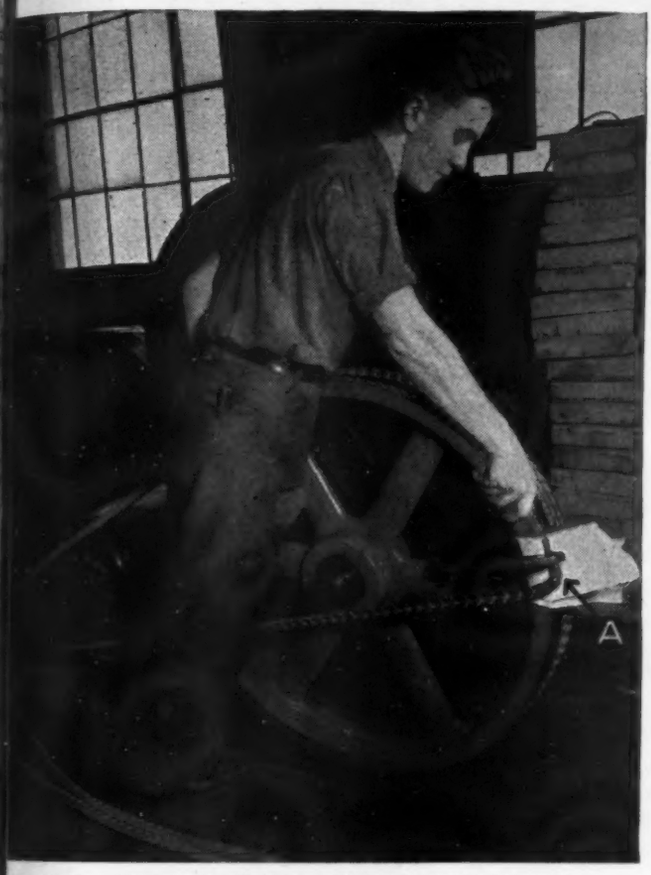
• IF THE MANILA ROPE SHORTAGE has affected you, a chart prepared by the Chain Institute, Inc., 208 S. LaSalle St., Chicago, comparing weldless chain strengths with rope strengths can be of help. The table brackets 10 ropes under 1 inch in diameter with the weldless chain that provides comparable strength.

• TRANSPORTATION for the war plant employee is the subject of Booklet 1—"The Problem," first of a series being published jointly by the National Association of Manufacturers and the National Conservation Bureau on such transportation subjects as group riding, transit improvements, staggered hours, parking lot problems, maintenance of employee cars. Copies are sent upon request from the National Association of Manufacturers, 14 W. 49th St., New York.

• "SAFETY Speeds Production" is a handy little booklet for supervisors to use as a guide in enforcing safety. Presented in "Do-you-know?" form, the booklet offers the supervisor a yardstick by which to measure his knowledge of safety standards. Issued as Special Bulletin 11 by U. S. Department of Labor, Division of Labor Standards, Washington, D. C.

• "A MESSAGE from the Women Soldiers of the Production Front" is an illustrated booklet containing the speeches of four women workers selected by women co-workers in the welding, machine shop, small-tools, and assembly departments to represent them at a monthly meeting of their plant's supervisory group. Pictures show the girls on the job. A copy of the booklet is available from the Link-Belt Ordnance Co., 306 W. 37th St., Chicago.

He's Getting Ready to Speed PRODUCTION



Position of correct length Veelos V-belt before drive is turned.

DO what he's doing... install Veelos... the proved and practical V-belt... and you'll gain the advantages of a *peak* production drive. Construction of the Veelos link provides quick, easy tension adjustment to end slippage... keeps machinery running at full speed and productivity. Install Veelos and make the most of your machines and manpower.

FREE! COMPLETE, NEW VEELOS PRODUCTION MANUAL!

This free manual—"Drive Production Higher with Veelos V-Belt"—gives complete instructions on use, length table, engineering data, detailed description of Veelos link construction. Shows how to measure, couple, uncouple any size of Veelos. Write today for your copy of this valuable reference.

IMPORTANT INSTALLATION DIRECTIONS

Sizes ⅜", A, B and C Veelos V-belts must be 1" per foot short of pitch length.

Sizes D and E Veelos V-belts must be ½" per foot short of pitch length.

1. Measure one belt on floor or bench from end rivet to first empty hole. Make up all other strands with the same number of segments.

2. After correct length has been determined, place belt in nearest groove of small sheave.

3. Place belt in nearest groove of large sheave as far as it will go to point A in illustration.

4. With SMALL sizes *hold belt with hand* at point A and turn drive until belt is in groove all around. With LARGE sizes *hold belt with "C" clamp or rope; put cloth pad* between belt and sheave rim.

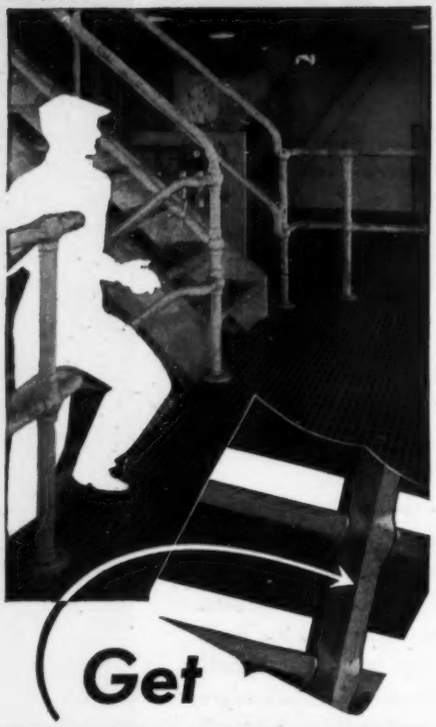
5. Turn drive until belt is in groove all around. (Caution: *Always turn drive manually.* If necessary, a bar can be used for leverage.)

6. Work belt across to inside grooves by turning drive. Repeat until grooves are filled.

Veelos is made in all standard sizes (⅜", A, B, C, D, E)
... fits all standard V-belt grooves

VEELOS
THE LINK
V-BELT
ADJUSTABLE TO ANY LENGTH
ADAPTABLE TO ANY DRIVE

MANHEIM MANUFACTURING & BELTING CO.
MANHEIM, PENNSYLVANIA



Get
BATES-GRATES
FOR YOUR OPEN STEEL FLOORING AND YOUR FLOORS, TOO, WILL BE CLEANER AND SAFER

See that scraper tread—and the crisp lines of the Hex cross bar? *That* gives a safer and cleaner tread and at the bottom of those cross bars you find clean, well-shaped fillets made by the metal displaced in the Bates patented process—no metal is lost. The weld is cleaner and stronger. The *floor* is cleaner and stronger. Yet, open steel flooring made under Bates patents costs no more.

Write for 8½ x 11 booklet that explains all details and shows many fine installations.

WALTER BATES COMPANY, INC.
JOLIET, ILLINOIS
OPEN STEEL FLOORING • STAIR TREADS

Significant Labor Developments

Period surveyed: May 10 to June 10

TREND INDICATORS

Hiring Restrictions

In the plan recently outlined by WMC, employers are barred from hiring any worker from outside the local community area without the approval of the U. S. Employment Service. Employers in the area affected may not hire any workers from an essential activity unless the worker can present either a statement of availability from his most recent employer or a referral card from the U. S. Employment Service.

The statement may be issued "on the ground that an individual's wage or salary rate is substantially less than that prevailing in the locality" *provided the change will aid in the prosecution of the war.*

Exemptions From 48-Hour Work Week

1. Individuals or jobs exempt from the maximum hour provisions of the Fair Labor Standards Act.

2. Office and clerical workers of executive, sales, and administrative offices, as distinguished from general mill offices, as long as and to the extent that employment opportunities are not generally available to such workers upon their release.

3. Regional Manpower Directors are authorized and directed to grant temporary exemptions from the 48-hour minimum work week only in those departments of establishments where failure to adopt the minimum wartime work week is due to production requirements, directives of the WPB, the allocation of materials, or other reasons beyond the control of the employer. Such a temporary exemption will remain in effect only as long as the circumstances on which it was based continue to exist.

Prior to making his decision on any release schedule or application for exemption or for approval of hirings the Regional Manpower Director is directed to consult with representatives of management and of the collective bargaining agency in the establishment recognized as such for the purposes of the National Labor Relations Act.

Appeal From Hiring Controls

Regulation 5 sets up the machinery for appeals from any WMC action under employment stabilization plans, the 48-hour week policy, and other manpower regulations.

An employee may appeal whenever WMC refuses to allow him to take employment or to issue to him a statement of availability, or requires his release from employment, or determines that he has violated any WMC regulation.

An employer may appeal whenever the WMC denies him the right to employ a worker, or issues a statement of availability to any of his employees, or requires or refuses permission for the release of his workers, or determines that he has violated any WMC regulation.

All appeals must be made within the period of time after the decision (not less than three days) prescribed by the Regional Manpower Director.

Bonus Included in Regular Rate

Sums paid as a bonus must be included in determining an employee's regular rate of pay for purposes of computing overtime pay under the Wage-Hour Law.

Effect of Bonus on Regular Rate

Bonuses paid to employees computed on a fixed or predetermined basis must be included in the "regular rate of pay" on which the employees' overtime rate is based and is to be apportioned over the weekly periods in the quarter or year during which it is paid. Where, however, the bonus is paid as a percentage of the employees' earnings during the period, including both straight and overtime, or where the payment of the bonus is entirely within the discretion of the employer, it need not be included in computing the regular rate. (Opinion of the Administrator)

Overtime for Exempt Employees

If the work of executive or professional employees (generally exempted under the Act) is of a nature different from their regular duties and is in excess of the 20 percent provided by the Act, it must be calculated as overtime.

Administrative employees who are not subject to the 20 percent limitation are likewise entitled to overtime for the performance of extra unrelated and non-administrative work.

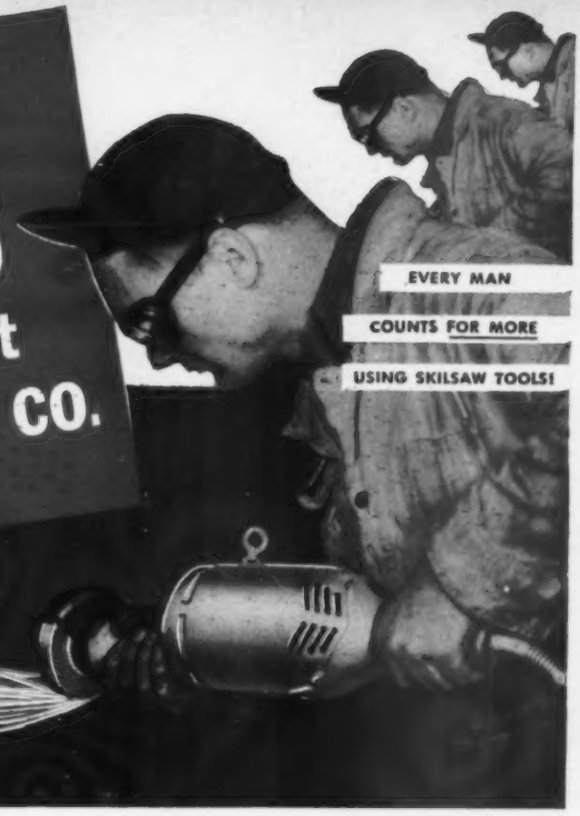
Overtime "Kickback" Contract Held Illegal

Agreements by unions to reimburse employers for overtime payments for work performed on the sixth day whenever the union was unable to supply the company with all the labor it needed at straight-time wages, was held to be illegal "kick-back" in violation of the Wage-Hour Law. (Wage-Hour Division Opinion)

No Waiver

Payment by an employer of part of the overtime compensation due employees

Here's how SKILSAW TOOLS BOOST PRODUCTION at LINDBERG ENGINEERING CO.



SKILSAW PORTABLE GRINDERS—Speed up all grinding, wire brushing, buffing and polishing on metal surfaces . . . remove rust, scale, paint, etc.

ARMY E NAVY

Ask over at Lindberg Engineering Company . . . and you'll hear plenty about the speed of SKILSAW TOOLS in turning out essential heat-treating equipment. Look around the Lindberg plants that fly the Army-Navy "E" . . . and you'll see plenty of SKILSAW TOOLS in action . . . speeding up countless drilling, sawing and surfacing operations!

Here's the reason! SKILSAW TOOLS are lighter, more compact, more powerful. They're *preferred* by workers and management alike because they *handle easier* . . . do more jobs *better* . . . and stand up *longer* under today's toughest conditions. Ask your distributor to prove it with a demonstration of SKILSAW TOOLS on your own work *today!*

SKILSAW, INC., 5043 Elston Ave., Chicago, Ill.

New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit
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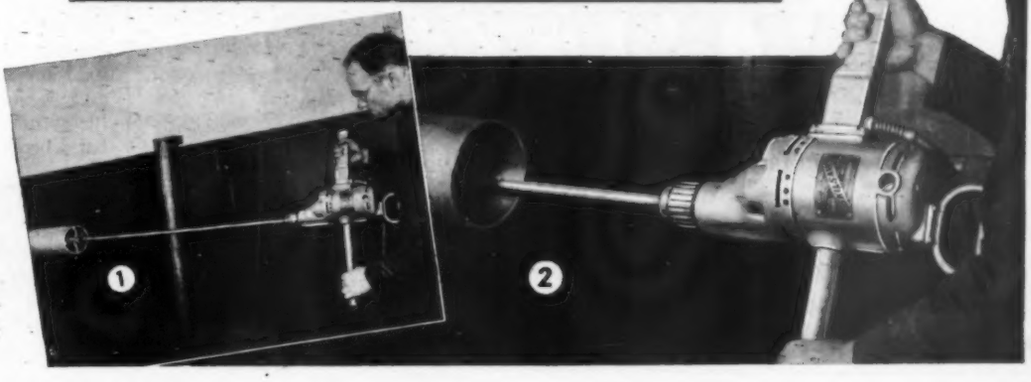
SKILSAW DISC SANDERS—For faster sanding on flat or curved surfaces of wood, metals, compositions. For grinding down raised welds, surfacing, preparing for finishes, buffing and polishing.

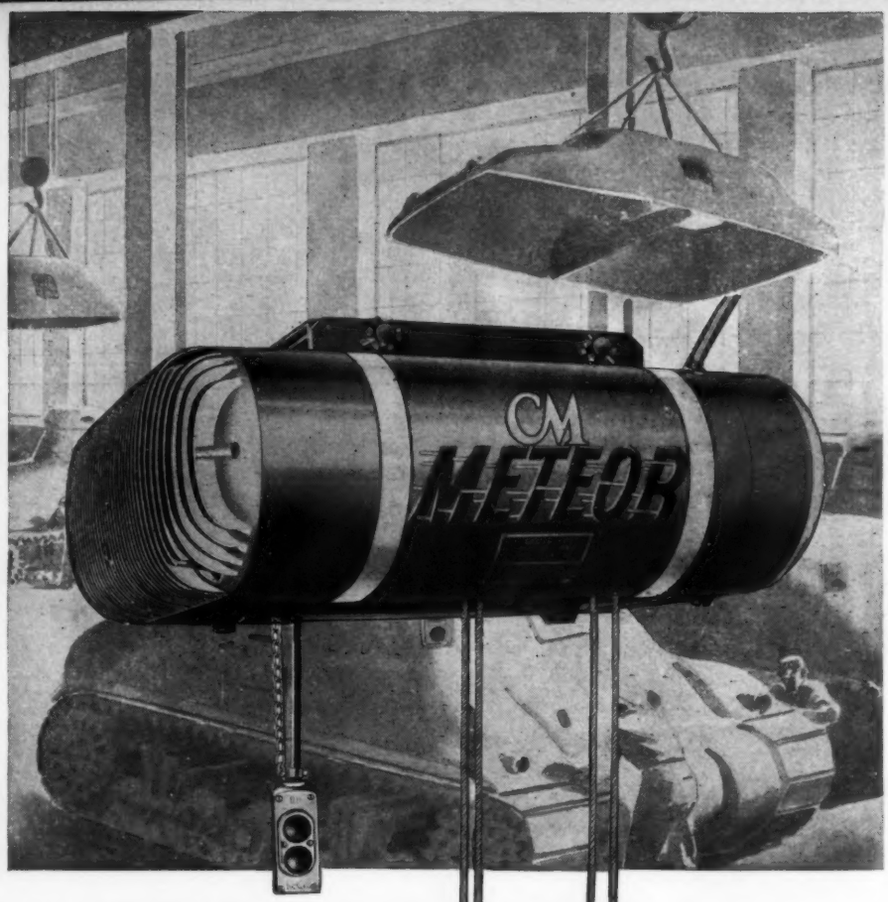
SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★



1. With a special rig devised by Lindberg engineers, SKILSAW Model 123 DRILL hones the interior of this air-tight steel cylinder; replaces complicated hard-to-get machinery.

2. Honing rig on long shaft (smoothly driven by SKILSAW DRILL) is moved forward and back by operator, to produce the polished high precision surface necessary.



OVERHEAD HIGHWAYS

that speed War production

CM Throughout the nation CM Meteor heavy duty electric hoists ride the over head highways... speed War production in the lifting and transporting of materials and assemblies. CM Meteors lessen worker fatigue and reduce time-wasting interruptions. One hand push button control provides accurate spotting and leaves the other hand free for guiding the load. The CM Meteor is readily adaptable to present overhead monorail systems and cranes. Fully illustrated engineering catalog No. 142 explains why the CM Meteor will help you speed production.

CM METEOR

★ ★ ★

INVEST REGULARLY IN VICTORY—BUY WAR BONDS AND STAMPS

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(Division of Columbus-McKinnon Chain Corp.)

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under the Wage-Hour Law does not constitute such an accord and satisfaction as to prevent employees from maintaining a wage suit, even though they agreed not to sue. (Timberlake vs. Day & Zimmerman, Inc.)

Reformation of Contract Denied

The New York Supreme Court denied an employer's request to reform an employment contract to make weekly payments cover both straight-time and overtime payments required under the Wage-Hour Law. The employer's mistaken belief that the salary agreed upon covered both straight and overtime, and the resultant hardship, was no ground for relief, since the mistake was one of law and not fact. (Wolf vs. Bell; E. & A. Building Corp. vs. Gunderson)

Employee Action Limited

The Circuit Court of Appeals ruled that only the Wage-Hour Administrator may enjoin a violation of the Act and an employee who had been wrongfully discharged could not enjoin such violation and compel reinstatement.

Employee actions may be maintained only under Sec. 16(b) to recover back wages and liquidated damages. (Bowe vs. Burns)

Records

A federal district court barred the employee in whose name the action was brought from recovering back overtime pay for more hours than were shown in payroll records which he typed and admittedly falsified. The ban, however, was not extended to other employees on whose behalf he had sued. (Deutsch vs. Heywood-Wakefield Company)

Wage-Hour Interpretations Subpoena Enforced

A Circuit Court of Appeals decided that a court will enforce a subpoena issued by the Wage-Hour Division without determining whether or not the particular company is covered by the Wage-Hour Law. The decision is based upon the Supreme Court ruling which upheld the right of the Secretary of Labor to obtain enforcement of a subpoena under the Walsh-Healey Act without a prior hearing on coverage. (Martin Typewriter Company vs. Walling)

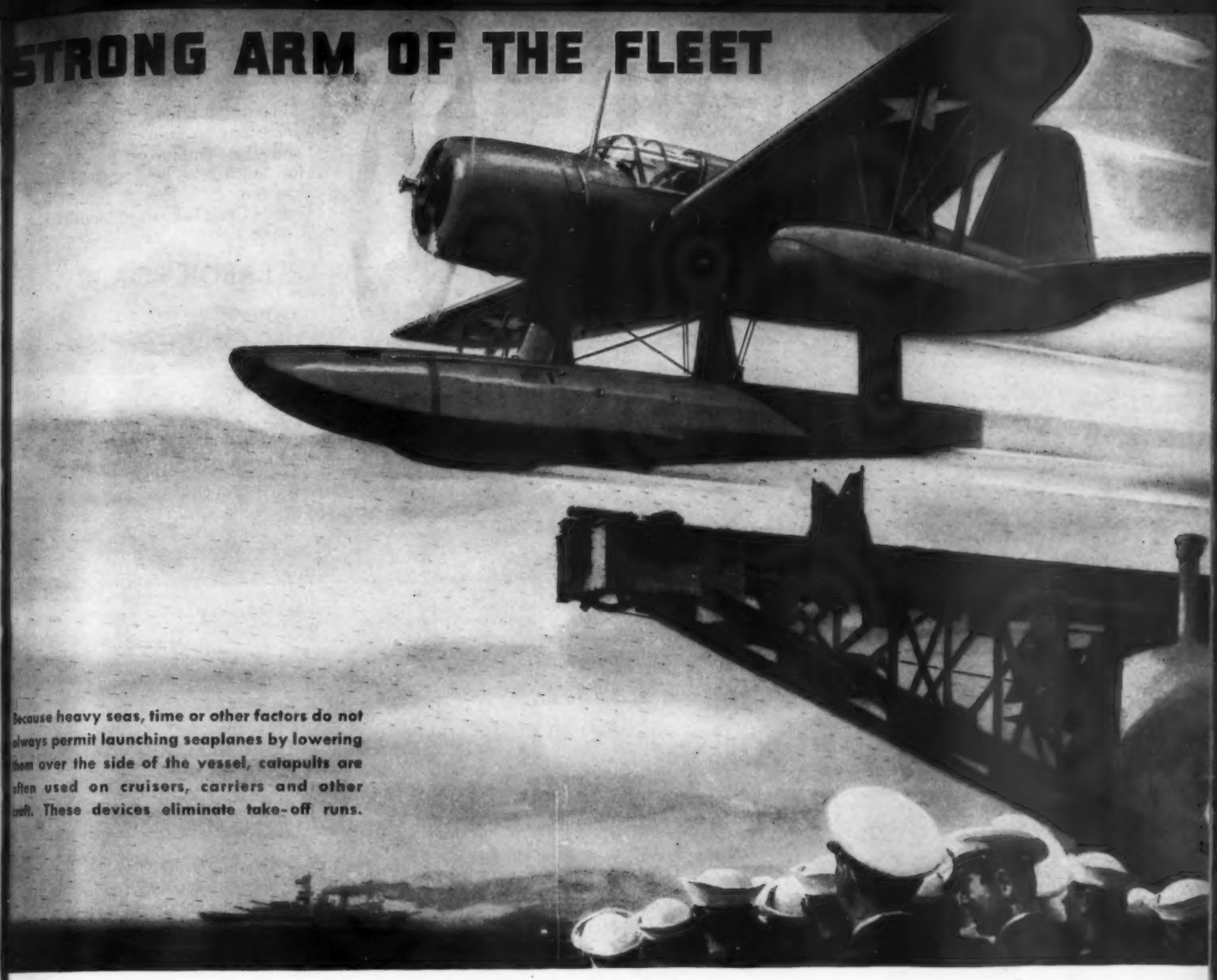
Enforcement

The Wage-Hour Administrator may enforce issuance of a subpoena duces tecum requiring the employer to produce, among others, his accounts payable records including gross sales records. The Administrator has initial discretion to conduct such an investigation if pursued soundly and impartially for the purpose permitted by statute. (Walling vs. American Rolbal Corporation)

Establishing Overtime Without Records

In the absence of contradictory evidence, newspaper employees were permitted to establish overtime by selecting from the paper's files articles on which they had worked after regular hours, and to cal-

STRONG ARM OF THE FLEET



Because heavy seas, time or other factors do not always permit launching seaplanes by lowering them over the side of the vessel, catapults are often used on cruisers, carriers and other craft. These devices eliminate take-off runs.

TO THROW an airplane into the air takes a mighty strong arm. Launching these eyes of the fleet from a cruiser deck is the job of the catapult.

Gears on the catapult must be rugged to stand the punishing shock that comes when the speed of the airplane weighing more than two tons is increased from 0 to 70 miles per hour in a distance of 60 feet!

The gears in the engines powering these planes must be tough, too. For though light in weight, their job is to transmit the power of 2000 horses to whirling propeller blades.

Making these gears—the rugged ones for the launching devices and the marvels of high precision for the airplane engines—is Foote Bros.' job, and Foote Bros. are proud of the service that the gears they make are rendering—proud of the manufacturing know-hows, the advancements in techniques that have been developed to produce these gears in the tremendous quantities needed for an America at war.

But more important to American Industry is what these manufacturing know-hows will mean to peacetime production. For experience gained today in producing gears that are tougher—gears that possess a higher degree of precision—gears that demand the latest manufacturing technique will assure more economical power transmission—more efficient machines for American Industry when the war is won.

FOOTE BROS. GEAR AND MACHINE CORPORATION
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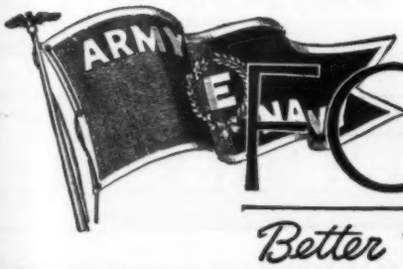

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Better Power Transmission Through Better Gears

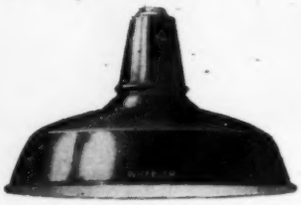
"WAR-AID"

Fluorescent Fixtures *by Wheeler...*

Sturdy metal-conserving wiring channel. Non-metallic reflector with chip-proof washable surfaces. Made for 2 or 3 40-watt lamps, or 2 100-watt lamps. Easily adapted for continuous runs.

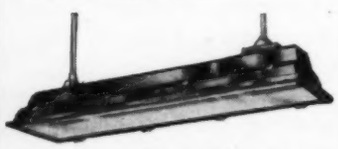
- maintain "skilled lighting" standards
- conserve critical materials

OTHER WHEELER FIXTURES



RLM One-Piece Solid Neck Reflectors

Made in Dome, Angle and all other standard types. For indoor or outdoor use.



Class II-G Dust-Tight Units

Fluorescent fixtures approved for "Class II-G" hazardous locations. Hinged cover protects lamps, sockets and reflecting surfaces. Made for two or three 40-watt lamps.

IT takes accurate "seeing" by workers to maintain today's precision standards of production. In any warplant, that means lighting of the most modern, efficient type.

To make such lighting available *in spite of wartime metal shortages*, Wheeler Reflector Company developed "War-Aid" RLM Fluorescent Fixtures. Made with minimum strategic materials... designed with "know how" gained in over 60 years of specialized experience... "War-Aid" Fixtures offer the same high-efficiency illumination that has always typified Wheeler "Skilled Lighting."

Whether you require fluorescent or incandescent illumination, Wheeler can supply *skilled lighting* for precision production. Write for catalogs of both types. **Wheeler Reflector Co., 275 Congress St., Boston, Mass.** ... New York, Cleveland. Representatives in principal cities.

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culate the time spent in collecting data for and writing the articles. (Mabee vs. White Plains Publishing Company)

The fact that an employer's yards were open and that employees took half an hour for lunch was held sufficient basis for calculation even though records were not kept. (Campbell vs. Mandell Auto Parts Corporation)

WAR LABOR BOARD

* *Jurisdiction Rejected*

WLB refused jurisdiction of a case where rates were fixed in an existing and valid collective bargaining contract. (Major Film Distributors)

Remedy Through Federal Procedure First

WLB has jurisdiction to require parties to comply with an arbitration award before either of them has appealed to the state court to enforce the award in a matter involving a labor dispute under state law procedure.

Under the Executive Order establishing the WLB (9017), parties to a dispute must first resort to direct negotiations; if the dispute is not settled in this manner, the U. S. Conciliation Service should be asked to intervene. Failing settlement, the Secretary of Labor will certify the dispute to the Board for final determination. (Reader Mail, Inc)

* *Individual Adjustments Which May Be Made Without Approval*

WLB's General Order 31 further restricts the individual wage or salary which may be made without Board approval.

A plan for individual adjustment with rate wages in existence on May 31, 1943, does not require approval if:

1. It is in a collective bargaining agreement in existence on May 31, 1943.
2. It is in accordance with the employer's practice prior to Oct. 27, 1942, which can be proved either by a plan formally communicated to the employees or by payroll records.
3. It was specifically approved by WLB.

Otherwise, increases for merit, length of service, promotion, reclassification, or under a trainee system must conform to WLB specifications or to the number of employees who may receive increases, the number of increases which may be given in a year, and the permitted amount of any increases.

Individual adjustments must not materially increase the level of production costs.

Increases WLB May Grant

WLB has had restored to it the authority to make wage increases necessary "to correct gross inequities or to aid in effective prosecution of the war." The Board, however, has not regained its power to make adjustments to correct inequalities, except intraplant.

Director Byrne's directive limits the Board in making wage adjustments by

* In this and the following classification items marked with an asterisk also are considered to be trend indicators.

T-J DIE SINKING MILLING CUTTERS meet today's production requirements for speed and accuracy with *more work between grinds!*

Long years of T-J leadership in this field make T-J Cutters "tops" in design, sturdiness, ability to hold a sharp edge and carry less breakage percentage. T-J Cutters are made from a standard, extremely high grade steel... assuring extra strength, wear resistance and uniformity. Send for new catalog.
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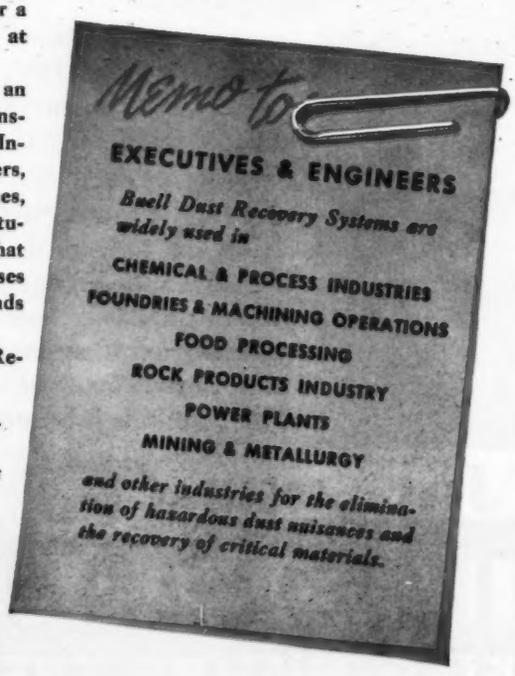
MAKING HEAVY BOMBERS LIGHT

Buell Dust Recovery Systems play an important part

The lighter the bomber itself, the bigger its bomb load. So America's air might is muscled with modern metals — aluminum, magnesium, beryllium, molybdenum and others—that are miracles of both strength and lightness. In the bombers above, for instance, motor weight per horse power is barely over a pound—down from 12.7 lbs. per h.p. at Kitty Hawk.

Buell Dust Recovery Systems play an important part in the process of transmuting ore into these vital metals. Installed in conjunction with pulverizers, kilns, roasters and sintering furnaces, Buell cyclones recover for re-use virtually 100% of the critical material that would otherwise escape in the flue gases —a saving that mounts up to thousands of tons annually.

The high efficiency of Buell Dust Recovery Systems is due to the van Tongeren cyclone—an ingenious design feature found only in Buell equipment. Long life, low operating cost, negligible maintenance and unlimited capacity are other important advantages that have made Buell Dust Recovery Systems first choice with so many great industrial concerns.


Memo to
EXECUTIVES & ENGINEERS
Buell Dust Recovery Systems are widely used in
CHEMICAL & PROCESS INDUSTRIES
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FOOD PROCESSING
ROCK PRODUCTS INDUSTRY
POWER PLANTS
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and other industries for the elimination of hazardous dust nuisances and the recovery of critical materials.

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DUST RECOVERY SYSTEMS

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BUY WAR BONDS AND MAKE THE AXIS BITE THE DUST

production cost and product price factors. If the price of the product must be raised to compensate for higher wages, or production costs must rise because of higher labor charges, wage adjustments approved by WLB will not be effective until further endorsed by Byrnes.

Profit-Sharing Trusts Require Approval

Employer contributions to profit-sharing trusts are deemed to be salary payments for the purposes of the Stabilization Order, even though they satisfy the requirements for tax exemptions under the Income Tax Law. Such profit-sharing trusts differ from pension trusts and require approval.

* *Substandard Wages*

Hiring rates for women which range from 32½ cents to 40 cents and an hourly rate for men of 50 cents are sufficiently low to be called substandard.

An employer was ordered to raise rates to 40 cents an hour for women and 52½ cents an hour for men or to grant a 5 cent general increase, whichever was greater. (Frankel Brothers & Company, Inc.)

A Regional Board refused to award an increase above 50 cents an hour even though its refusal created an interplant inequality. (Wilcox Electric Company)

What Is Substandard

WLB, after granting a general wage increase of 2 cents an hour, awarded an additional 3 cents to all employees earning less than 47 cents an hour, to correct substandards of living. (Lewis Meier & Company)

Regional Boards at Kansas City and Denver use rates of 45 cents and 50 cents an hour as yardsticks in approving increases to correct substandards. (Buckeye Cotton Oil Company, Ellis Canning Company)

Substandard Wage Ruling

In the first ruling on substandard wages under Executive Order 9328, WLB ordered an incandescent light company to increase its base rate up to 45 cents per hour and ordered a general increase to average 10 cents an hour. The Board refused to define the term substandard or to commit itself to a minimum standard rate but did urge the elimination of inequalities between job rates within a wage scale and advised against the creation of inequalities within a particular area. (WLB Directive)

WLB granted flat increase of 12½ cents per hour to 4000 telegraph workers to correct substandard rates. The Board justified this unorthodox method on the ground that the raise in question was needed to effect so substantial a correction of the general level of rates as to overshadow any consideration of rate variation within the company's wage scale. (WLB Directive)

The Boston Regional Board approved a job classification plan granting increases to 40 percent of the employees on the ground that such increases did not constitute general increases nor did they sub-

Tom the foreman says:

"We Use Only KENNAMETAL* To Machine Steels"

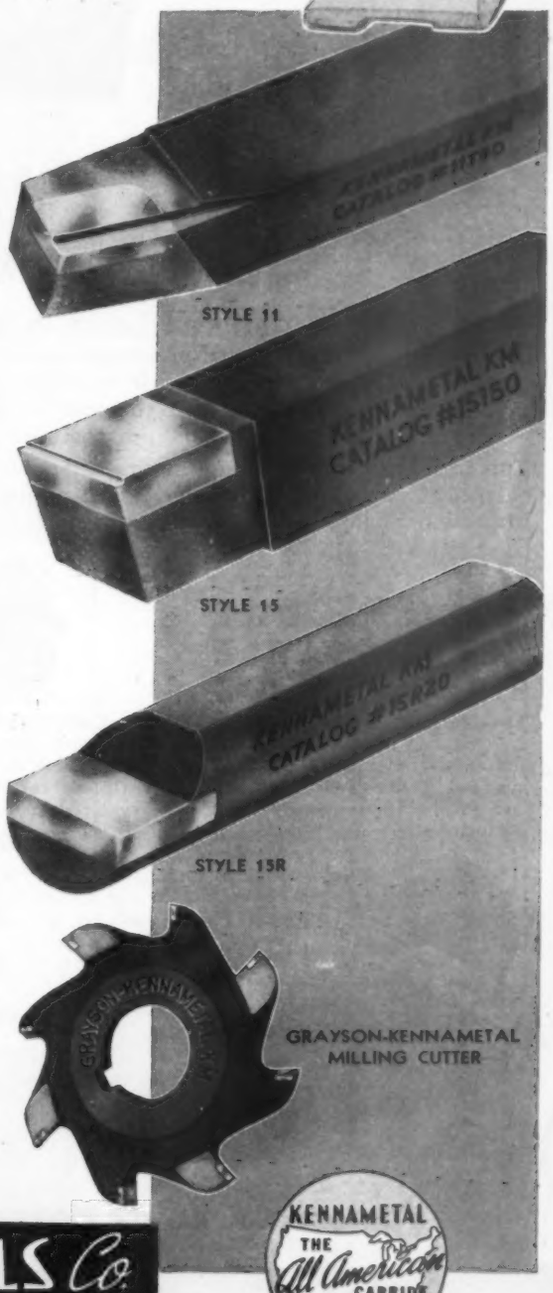
"Like ours, any plant that uses only one make of equipment for a particular purpose has good reasons for it. We have found through years of machining steel that Kennametal outproduces high speed steel and ordinary carbides on steel-cutting jobs. Kennametal produces many more machined parts per regrind and consistently has longer life.

"Regardless of the nature of the steel, Kennametal performance demonstrates superior cutting abilities. In our plant we also use Kennametal cutters for maximum production on milling operations.

"The non-galling properties, resistance to cratering, hardness, and superior transverse rupture strength enable Kennametal to efficiently machine steels which cut with an extremely tough chip.

"Difficulties such as sand holes, weld spots, interrupted cuts and hard scaly surfaces, which rapidly consume other types of tools, are taken at efficient speeds with Kennametal. We don't care how tough the job is; we know Kennametal will do it the best."

If you machine steel, write for Kennametal catalog No. 43B which will aid in selecting the proper tools for your steel-cutting operations.



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HERE'S WHY ROPER PUMPS perform better ...last longer!

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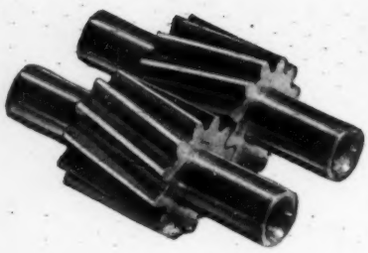


GEARS THAT float IN OPERATION

The pumping gears in ROPER "hydraulically balanced" PUMPS have hollow shafts so that internal pressure is equalized at all points. These gears, entirely separate from the drive shaft, are connected only by a sliding joint which permits them to actually "float" in operation. This sliding joint plus a special collar on shaft absorbs any shock or end thrust. This feature means big savings in time and money because "hydraulically balanced" pumps are more efficient, last longer and permit periodic inspection of internal parts without disturbing piping or power unit.

FOUR LARGE REPLACEABLE BEARINGS

The 4 large bearings (two on each side) in ROPER PUMPS are designed and constructed to withstand severe operating abuses and adequately handle peak loads. These flanged high lead bronze bearings also act as wearplates to protect face and backplate from wear. Can be replaced easily and inexpensively.

QUICK FACTS

CAPACITIES—1 to 1000 gallons per minute.

PRESSURES—up to 1000 lbs. per square inch.

SPEEDS—up to 1800 revolutions per minute.

MOUNTINGS and DRIVES for any practical use including hand-operated units.

Write for Catalog
No. 738

A complete summary and digest of factual information concerning pumps and pumping problems.

GEO. D. ROPER CORP., ROCKFORD, ILL.

ROPER Rotary PUMPS

stantially increase the cost level. (Atwood Machine Company)

* *Increase Granted*

WLB approved increases retroactive to September 6, 1492, as cost-of-living adjustments under the Little Steel formula. (New York Telephone Company)

* *Award Conformed to Little Steel Formula*

Applying the Little Steel formula, WLB reduced to 3 cents the recommendation of its panel for a general wage increase of 8 cents per hour. (Big Four Rubber Companies)

Equal Pay for Equal Work

The War Labor Board advised that the President's "hold-the-line" Order of April 8 does not bar adjustments to equalize the wage or salary rates paid to women with rates paid to men for comparable work. The principle of equality however has no application to cases involving jobs to which only women have been assigned in the past—e.g., attempts to increase wages being paid to women in one plant on the ground that in some other plant similar work is being done by men at a higher rate. (WLB Directive)

* *Delivery Stoppage Tantamount to Strike*

WLB warned that acts of omission may constitute a violation of labor's "no-strike" pledge as well as acts of commission. Failure to make deliveries was held to constitute such an act of omission in violation of the spirit and intent of the "no-strike" agreement. (New Bedford Rayon Company)

* *Strike Penalty*

WLB unconditionally directed that cancellation of the union security clause be a penalty for work stoppage. (Lamson & Sessions Company)

* *Strike Policy*

In an effort to curb strikes, a Regional War Labor Board levied fines against strikers and conditioned the benefit of the maintenance-of-membership clause on the union's proving its responsibility. (WLB Directive)

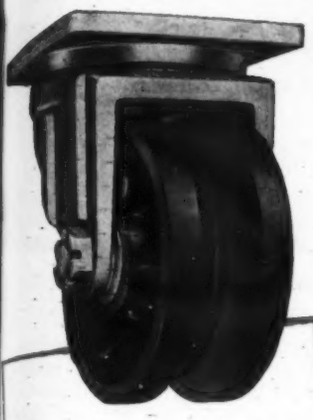
For violation of labor's no-strike pledge and management's no-lockout pledge a Regional Board directed reinstatement of the strikers with some back pay, amounting to less than unfair labor practice strikers would obtain in similar circumstances in a dispute governed by the Wagner Act. Back pay was made to run from the time of the discharge or lockout and not from the time of refusal to reinstate. (WLB Directive)

Because it engaged in a brief strike while a WLB panel was discussing a requested check-off, the check-off award was denied. (Mead Corporation)

However, in another case, despite the occurrence of wartime work stoppages and sitdown strikes, the union was awarded the maintenance-of-membership clause where the employer was found to have demonstrated an anti-union attitude

Quick, Flexible, Low-Cost Conveying..

Bassick Precision Casters helping to roll out Curtiss Wright "Hell-divers" ahead of schedule.



Only Bassick Works to Such Close Caster Tolerances!

Originators of grooved-wheel casters, Bassick offers a complete line, including the Precision Super Heavy Duty Caster with grooved-wheel shown above. With Precision grooved-wheel Casters, loads are carried smoothly, safely, and at controlled heights.

on Track Using Bassick Grooved-Wheel Casters

You can handle production on portable equipment far more smoothly, quickly and economically — and save space — by using Bassick grooved-wheel casters on angle floor track.

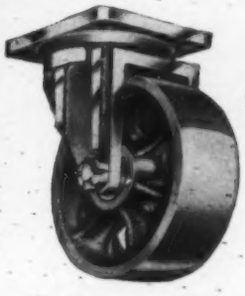
It's the newest, simplest way to solve production line problems in times of rapid change or re-conversion, for you can remove or re-arrange whole units of production without costly disturbance. And the equipment can be moved on floors as well as on track.

No wonder practically every major aircraft assembly plant has installed one or more of these systems.

Investigate Bassick grooved-wheel casters. Bassick engineers are ready to consult with you on special problems or installation details. The Bassick Company, Bridgeport, Connecticut.

Bassick "floating hub" Casters

absorb shocks — even when rubber tires would bounce the load!



Bassick Super-Heavy Duty Casters

will carry any loads that can be moved on a given size of wheel!

Bassick Positive Position Lock

holds portable equipment securely in place.

"Bassick engineers design Casters no one else can beat! And the Bassick caster line Is the world's most complete!"

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MAKING MORE KINDS OF CASTERS ... MAKING CASTERS DO MORE

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BRIDGEPORT, CONN.
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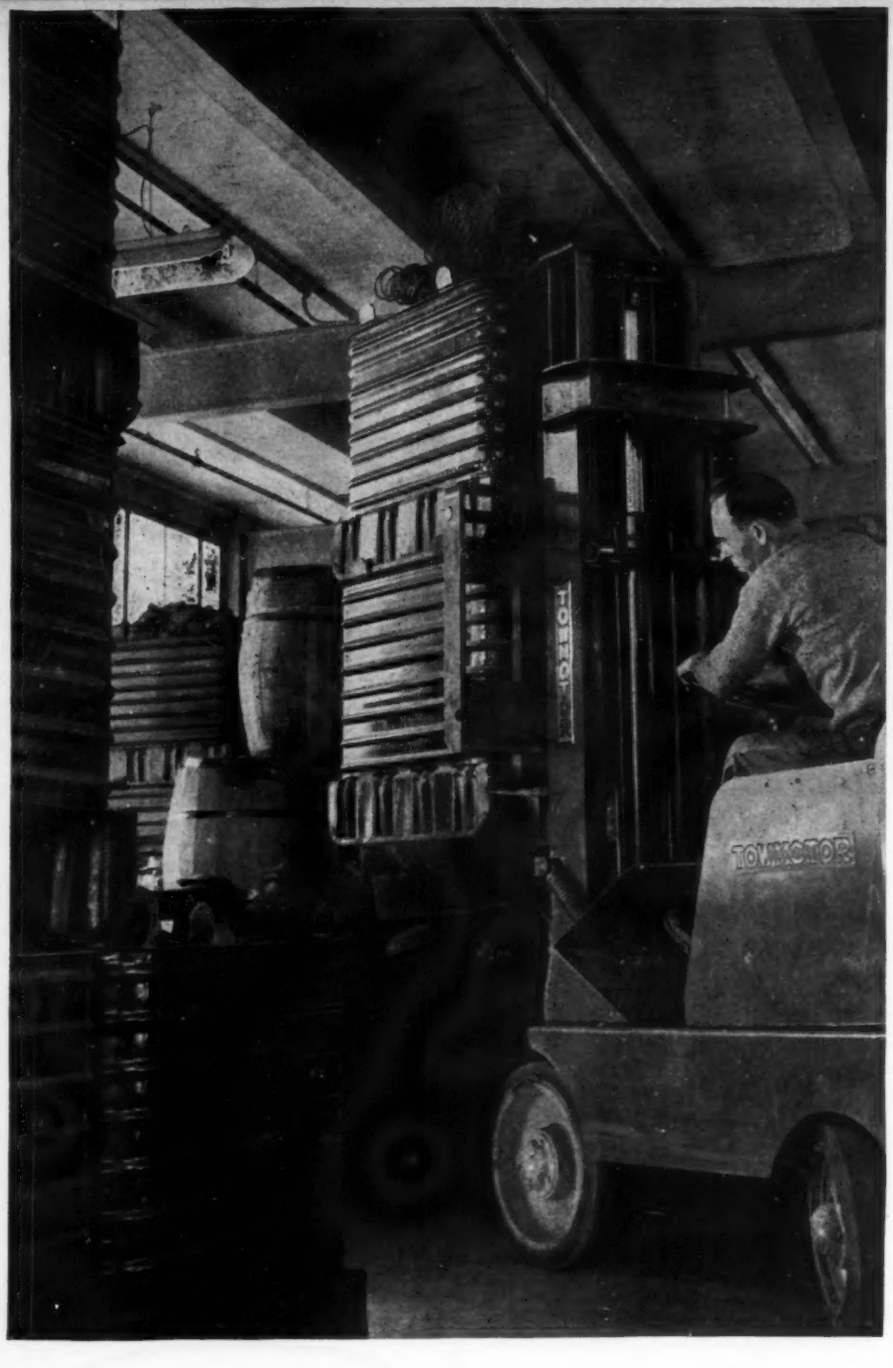

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is more efficiently governed when the flow of

supplies to and from storage is

regulated by **TOWMOTOR**

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THE 24-HOUR ONE-MAN-GANG

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STRAIGHT—GAS POWERED INDUSTRIAL TRUCKS EXCLUSIVELY—SINCE 1919

and the strikes were unauthorized by union officials. (Big Four Rubber Companies)

Reinstatement Ordered

WLB ordered that employees laid off because of curtailed operations be reabsorbed in a newly established plant of the same firm and retain their seniority rights. (Remington Rand Company)

Sick Leave Plan

WLB instructed Regional Boards that they may approve any reasonable sick leave plan.

Vacation and Sick Leave Plans

WLB announced that it will approve all reasonable vacation and sick leave plans submitted to it by employers, but it has indicated that periods granted should not exceed the sound prevailing practice in the vicinity or area.

Union Shop Policy

WLB warned that it will not automatically permit continuation of union-shop conditions which have previously existed, although its general policy is not to disturb such arrangements. (Everbest Engineering Company)

WLB Settles Jurisdictional Dispute

In a dispute between rival unions, WLB ordered management to sign a new contract with the union previously certified as bargaining representative, since the latter is the lawful agent until some other union is certified. (Lamson & Sessions Company)

Holiday Absence Penalized

WLB approved insertion in a contract of a wage penalty for those who refused to do needed war work on holidays—i.e., withholding the usual holiday pay. The request to work however must come from government agencies or their prime contractors, and, as a safeguard, the union is held entitled to a statement identifying the agency which requests that work should proceed on the holiday. (Robaczynski Machine Corporation)

Disciplinary Clause Ordered

In line with its tendency to write clauses into contracts, WLB has ordered that a contract provide for disciplinary measures to be taken in the event that the contract is violated by employees or supervisors. (Tarbardrey Manufacturing Company)

NATIONAL LABOR RELATIONS BOARD

* *Entitled to Election*

An employer, though guilty of an unfair labor practice, is entitled to have an election directed, once representation proceedings have been begun. (Shafer)

* *Bargaining Agent May Be Redetermined*

Although a valid contract usually serves to prevent re-opening the question of the employees' proper bargaining agent, the

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PITTSBURGH,	1281 Reedsdale St., N.S.,	CEdar 7780 *Teletype PG. 475*
ST. LOUIS,	21st & Gratiot Sts.,	MAin 5235 *Teletype SL. 384*
TWIN CITY,	2545 University Ave. St. Paul, Minn.	NEstor 2821 *Teletype STP. 154*

GENERAL PURPOSE STEELS

Steel Products, Tools, Machinery and Equipment

A call to us may solve your problem. Many such calls have kept vital war production from being stopped for lack of some piece of steel—or some piece of machinery or equipment. If we have what you want, it can be yours *in a hurry*—subject, of course, to priority restrictions. If we don't have it, we'll do everything we can to help you find a source of supply. Try us—note addresses, phone and teletype numbers at right.

NATIONAL EMERGENCY ALLOY STEELS

These new steels have made it possible to meet the critical conditions imposed by the shortages of strategic alloys. They have given satisfactory results—in fact, have sometimes out-performed steels previously used.

We welcome your inquiries. We'll gladly assist you in determining the grades best suited to your needs. Phone, wire or write our nearest warehouse.

AIRPLANE STEELS

Our Chicago Warehouse has been designated by the War Production Board as a warehouse to distribute the aircraft materials listed below. They are for use in airplanes and available at our Chicago Warehouse only.

WD-X-4130 SHEETS. Open Hearth, Normalized, Pickled and Oiled to Spec. AN-QQ-S-685, Condition N. All gauges .016 to .50, sheets 18 x 72".

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STAINLESS STEEL BARS.....Spec. AN-QQ-S-771.

STAINLESS SHEETS .....Spec. AN-QQ-S-772. Spec. AN-QQ-S-757.

WRITE, PHONE OR WIRE, if you are eligible for these Airplane Steels, to United States Steel Supply Company, P.O. Box MM, Chicago, Ill. Telephone BRUnswick 2000 —Teletype CG. 605.

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(formerly Scully Steel Products Company)

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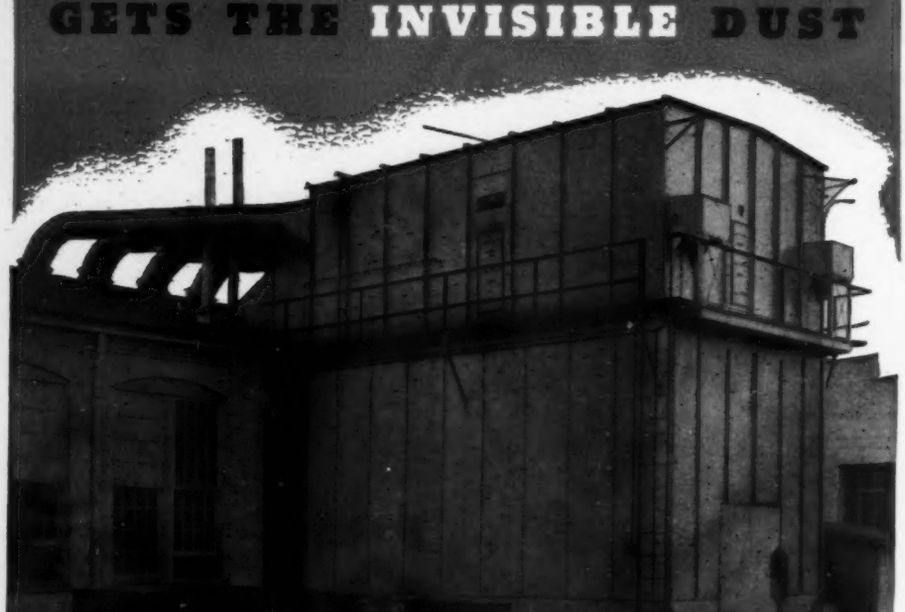
UNITED STATES STEEL

SLY DUST CONTROL

GETS THE INVISIBLE DUST



★ Sly Dust Filter exhausting from metal working machinery—boring machines, drill presses, lathes, etc., in a large machine shop. The disposal of the dust is handled in the housing underneath the filter resulting in a trim, orderly appearance—just as efficient as it looks.

Often industrial dust is invisible—yet none the less damaging.

Due to the efficiency of their special cloth screens, Sly Dust Filters collect even this extremely fine dust.

Throughout the past period of over 40 years, we have demonstrated the value of thorough dust control in suppressing or collecting 111 kinds of dust in 57 industries.

Briefly, Sly Filters offer you:

1. Greater filtering capacity because of more filtering cloth
2. Taut bags (patented) save power and improve dust removal
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Ask for Bulletin 98 and tell us about your dust problem so that we may write you fully.

THE W. W. SLY MFG., CO.

4755 Train Ave. Cleveland, Ohio

SLY
INDUSTRIAL DUST CONTROL

fact that an employer had explicitly recognized a union as majority representative does not prevent redetermination of the bargaining agent. (Henry Weis Manufacturing Company)

* *Coverage*

Although the Supreme Court had decided (Southern Steamship) that sea safety laws take precedence over the Wagner Act when protection of union activity cuts across protection of life and property at sea, this ruling will not shield a violation of the Wagner Act where no consideration of safety is involved. (Texas Company)

Although a firm is producing exclusively for the government under the supervision of a governmental agency it must still comply with the Wagner Act.

Restricting Unions

Union activity may be curbed when the restriction is reasonably designed to promote plant discipline and efficiency. It may not be applied to employees on their own time. On the other hand the Board found it necessary to the mutual aid and protection of union members working on shipboard that they be enabled to pay their dues, have assistance in settlement of grievances, and receive their union papers. Membership, however, could not be solicited. (Scullin Steel Company, Richfield Oil Corporation)

* *Layoff Permitted*

Layoff was held a valid disciplinary measure where employees publicized the fact that an inside union was company dominated. Since such publicity aroused resentment among the members of that union and the employer took a neutral stand, the layoff was held not to be discriminatory. (Aintree Corporation)

* *Unfair Labor Practice*

Attempts to substitute an independent contractor relationship for a direct employment relationship. The fact that the contractors owned their trucks did not prevent them from being employees within the meaning of the Wagner Act. (Field Packing Company)

Held Domination

The Supreme Court upheld a Labor Board ruling that a successor organization to an employee association was dominated by the company, since there was no sharp cleavage between the successor union and the employee association and the same employees had been active as officers in both. (NLRB vs. Southern Bell Telephone & Telegraph Company)

The Circuit Court of Appeals sustained NLRB's finding of company domination on the part of Weirton Steel. The mere fact that the company's attorney was ousted for contumacy was held not to have deprived the company of its fair hearing. (NLRB vs. Weirton Steel)

* *Held Domination*

An employer who failed to prevent employees from organizing an inside union during working hours was held by NLRB

to have acquiesced in their action although he reduced their wages during the time they were away from their work. (Clinton Woolen Manufacturing Company)

* *Held Coercion*

Management may be liable for remarks made by employees even though they are not directly associated with management—e.g., the conduct of an ordinary employee who thanks other employees for their anti-union activity when the words were spoken in the presence of the employer without any objection on his part. By his approval of these words the employer accepts responsibility for their utterance. (Burton Dixie Corporation)

On the other hand "set-up men" who prepared machines for the use of other workers were held not to implicate their employers through their remarks since they were not actual supervisors nor could they be identified with management. (Interstate Mechanical Laboratories)

Held Interference

An employer was held liable for violation of the Wagner Act when he accepted an offer by the majority of the employees to abandon their union in return for a wage increase. (NLRB vs. Medo Photo Supply Company)

* *Held Discrimination*

Discharge of a non-union member who had sought a raise and attempted to induce others to join him in the demand, was held discriminatory, since the employer's motive in the discharge was to discourage concerted activity for the benefit of the employee. (Central Steel Company)

Where an employee was assigned to work at which it was known that she was inefficient, and the work at which she was efficient given to another employee, NLRB found her discharge discriminatory. In another case, where an employee was assigned to a slower machine and was then discharged from the payroll because her output fell below standard, NLRB found no discrimination. The employee failed to report to her supervisors the reason for her lower production record and did not protest the notice of discharge. (Bardon of Hollywood)

A company may not discriminate against the union under the guise of eliminating delays in production. The delays were found not to have been occasioned by the activities of the discharged employees. (Piedmont Shirt Company)

* *Held Contempt*

The Circuit Court of Appeals held an employer liable for a violation of a court decree sustaining the Labor Board when he posted a notice informing his employees that they were not required to join a union to hold their jobs. Refusal of the United States Supreme Court to review this decision leaves it the prevailing law. (NLRB vs. American Mfg. Company)

* *Part-Time Employees May Vote*

Part-time employees working regularly may participate in employee elections although they are on full-time employment

TWENTY TONS of roaring bomber, hitting close to 300 miles an hour, pack plenty of punch to knock out enemy factories, mix it up with intercepting fighters, *get back home*... And those same twenty tons, coming in for a mile-a-minute landing, still pack plenty of punch, punch that has to be absorbed and dissipated by tough brake linings. Those brake linings take terrific punishment in bringing a bomber to a gentle stop—*take* it, because they're reinforced with wire screen: a sturdy steel backbone that resists tearing and wearing of the lining.

Nor is this the only fighting job wire screen is doing today. It reinforces gaskets for high pressure lines, strengthens boiler shell insulation, guards workers from high speed machine parts . . . It filters liquid fuels, stands guard over lubricating systems, screens coal and gravel and ores . . . In all of these and many other fighting assignments, Roebling Wire Screen is serving today—from 325 mesh of .001" wire up to screen with 6-inch openings of 1-inch rod stock! Serving in steel, iron, monel, copper, brass, aluminum, stainless—name your metal. Wherever you've got a fighting job for wire screen today, Roebling has the one screen to fill that job. And Roebling makes all Wire Screen promptly available to manufacturers of essential products.

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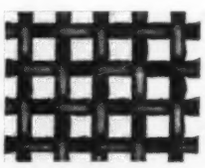
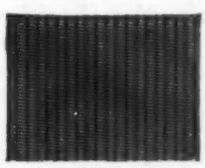
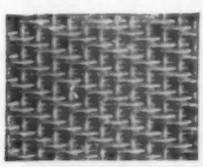
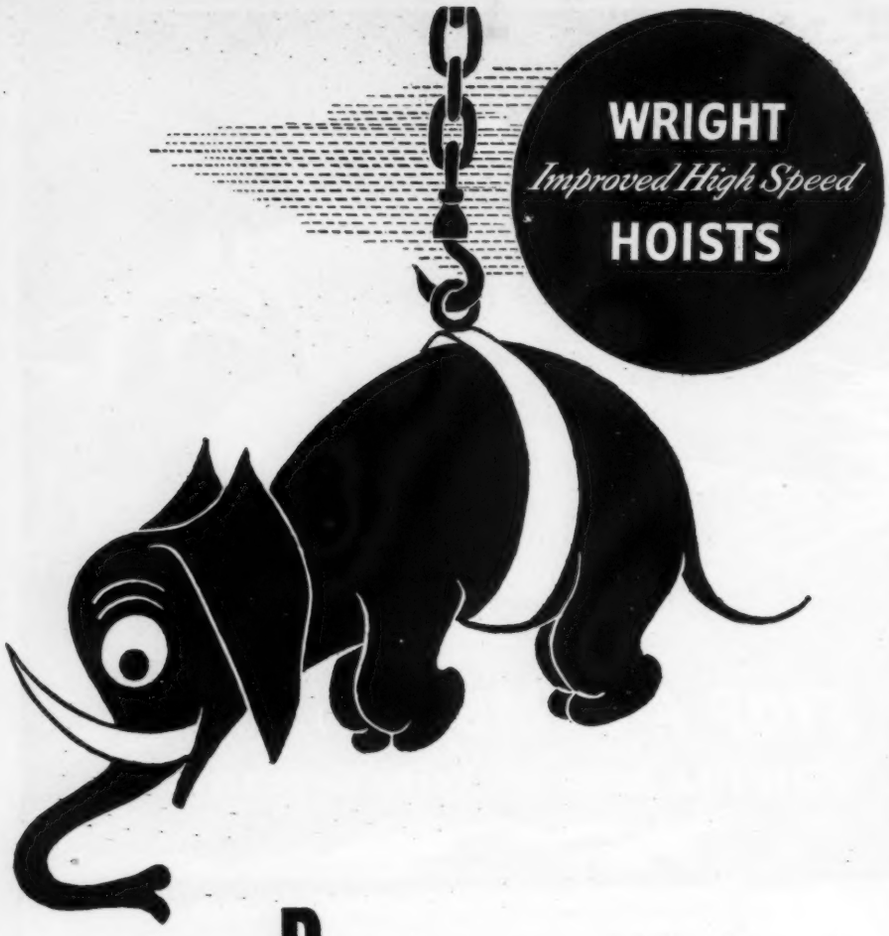

OBLONG OR SQUARE MESH WIRE CLOTH

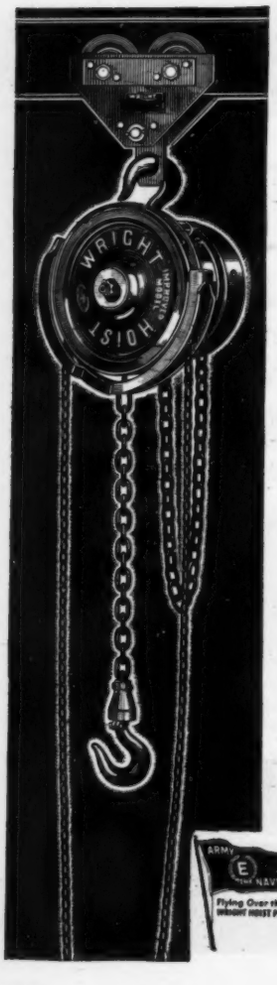

DUTCH PLAIN WEAVE FILTER CLOTH


DUTCH TWILLED WEAVE FILTER CLOTH

ROEBLING
WOVEN WIRE SCREENS
JAR ROEBLING



DON'T OVERLOAD!



WRIGHT HOISTS are built to carry more than their rated capacities, but like other well-made pieces of mechanical equipment they should not be overloaded. Overloading is dangerous—while today, abuse to machinery is akin to sabotage.

Watch the bottom hook. **WRIGHT** load hooks are drop-forged from special steel which, when subjected to excessive overloading, give visible warning by opening slowly. When the bottom hook has started to open, look to the top hook, too, for while it is stronger than the bottom hook, it also may be reaching a danger point.

Watch the load chain. **WRIGHT HOIST** load chains are electrically welded from special-analysis steel, exceptionally high in tensile strength and elastic limit. Excessive overloading will stretch the chains out of pitch, thus preventing proper fit with load wheel pockets. This results in destructive wear to both chain and load wheel. Keep your chains well-lubricated for long life. Take proper care of your **WRIGHT HOISTS.** You'll find the name of your nearest **WRIGHT** distributor in the telephone book.

In Business for Your Safety

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Flying Over the WRIGHT HOIST PLANT

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, Denver, Los Angeles, San Francisco, Portland, New York
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT, CONNECTICUT

with another employer, provided the part-time employment is not indefinite or intermittent. (Wagner Folding Box Corporation)

Reinstatement

An order of the Labor Relations Board reinstating a soldier is valid despite any claimed obligation of an employer to give preference to permanent employees over temporary employees.

** Discriminatory Reinstatement Prohibited*

In reinstating, an employer may not distinguish between an economic striker whose concerted activities are more objectionable or less objectionable to him and give preference accordingly. (Western Cartridge Company)

Agreement Upheld; Rejected

Though normally invalid, an agreement whereby the union contracted not to engage in union activities on the company's premises was held to be binding since the union consented and an NLRB officer approved the settlement agreement. (Merrimack Manufacturing Company)

But a union's promise to wait a year for a new election was held not binding since the Wagner Act permitted neither the Board, an employer, nor a union not acting as a bargaining agent to prevent the employees from exercising their statutory right to bargain collectively through any agent they may desire. (General Aircraft Corporation)

** Labor-Non-Labor Agreement Upheld*

A union was held not to have violated the Sherman Act when it entered into a contract with an employers' association to restrict the use of paint-spraying equipment. The agreement was deemed reasonable, since the restraint was incidental to the primary objective of protecting the employees. (U. S. vs. Bay Area Painters & Decorators Joint Committee, Inc.)

** Supervisor's Rights*

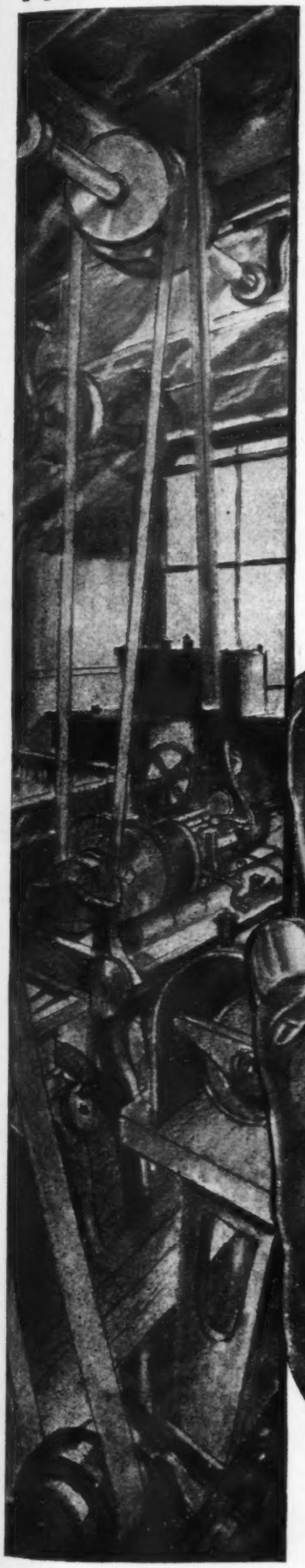
Reversing its former stand, NLRB has ruled that foremen and supervisory employees are not entitled to exercise the rights of collective bargaining. However, unions already designated will not be disturbed. (Maryland Drydock Company)

** Rewriting Contract Disallowed*

An employer is not permitted to have the court rewrite a collective bargaining contract so as to conform to the provisions for overtime required by the Wage-Hour Law.

There was no ground for "reforming" such a contract since nothing was omitted from nor was anything inserted into the agreement contrary to the intentions of the parties, nor was there any mutual mistake or mistake on one side and fraud on the other which resulted in the failure of the written agreement to express that which the parties had agreed upon. (Bailey vs. Karolyna Company, Ltd.)

PUSHING ASIDE OLD METHODS WITH INDUSTRY'S NEW RIGHT HAND

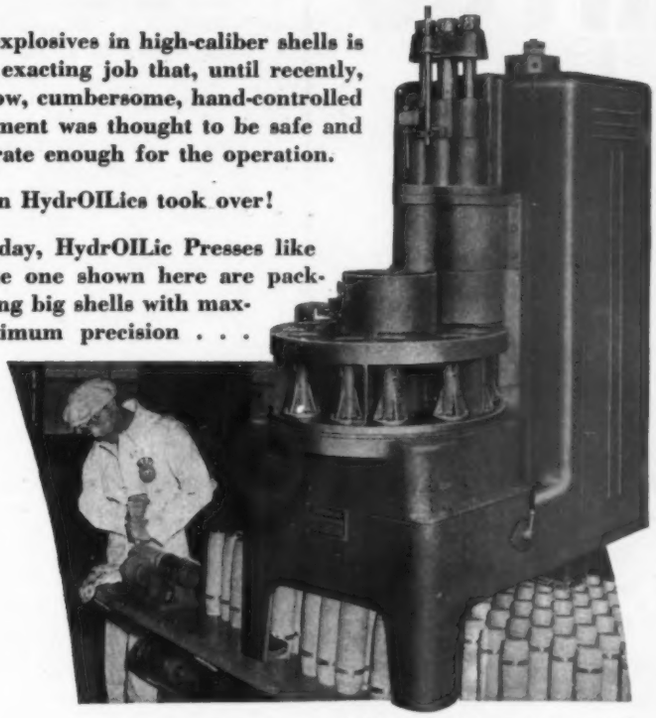


Shell Loading—A Ticklish Job Done Better And Faster!

Packing explosives in high-caliber shells is such an exacting job that, until recently, only slow, cumbersome, hand-controlled equipment was thought to be safe and accurate enough for the operation.

Then HydrOILics took over!

Today, HydrOILic Presses like the one shown here are packing big shells with maximum precision . . .



turning them out at a hitherto unheard-of speed . . . and with safety for the operator.

Shell-loading is just one of hundreds of jobs . . . in almost every industry . . . that are being speeded up, made safer, more accurate and more economical . . . by means of HydrOILic equipment or controls. *Applying* the smooth, flexible accuracy of oil hydraulic operation to Industry's production equipment is the specialized skill of Denison Engineers. That's why HydrOILics has become Industry's New Right Hand! Chances are, HydrOILics can give you a better answer to several production problems. Of course, we have a day-and-night war job to do, but our engineers can give you some sound ammunition for tomorrow's problems. Write today, or call your Denison representative.

The DENISON ENGINEERING CO.
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DENISON EQUIPMENT *in* APPLIED Hydr ics

Remember
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Don't forget—we are well qualified in experience and equipment to supply special bolts, nuts and studs to your specifications . . . and can supply them NOW in limited quantities for war production. Let us know your requirements.

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Estimates gladly submitted.
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TOOL COMPANY
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THEY SAY AND DO

Research Division Planned as Boon to Aircraft

An indication of the growth of airplane manufacture lies in a step recently taken by the American Institute of Bolt, Nut & Rivet Manufacturers, Cleveland.

Because of the great increase in questions relative to aircraft fasteners and because of the many requests for information or cooperation from such organizations as the Interdepartmental Screw Thread Committee, Army-Navy Air Corps, Society of Automotive Engineers, the War Production Board, and many aircraft manufacturers, the members of the Institute have authorized the setting up of an Aircraft Fasteners Division to function for them in aircraft products in the same general way as carried on heretofore in connection with other products.

The Institute feels that such a division will enable them to give more adequate and authoritative answers to questions that come up in connection with steels, cadmium plating, plating tolerances, and decarburization; and questions as to standards in dimensions and tolerances, sources of supply, and other matters regarding aircraft fasteners.

H. O. McCully of Russell, Burdsall, & Ward Bolt & Nut Company will act as chairman of the committee to establish the new division. Other members of the committee are J. W. Fribley, Cleveland Cap Screw Company; A. M. Jones, Buffalo Bolt Company; and C. F. Newpher, National Screw & Mfg. Company.

•

Five Capsules for Plant Management

(Methods of reducing absenteeism used in several northern New York plants are reported as follows by a correspondent in the territory:)

One of the most unusual plant stunts to eliminate absenteeism is a short puppet show, lasting about ten minutes, presented at the beginning of each shift. The factory arranged for a puppeteer to put on a skit about defense workers who were absent from work. Puppets represented Hitler, Hirohito, and American workers. Employees paid more attention to the puppet dramatization than to any other arrangement.

Another plant mails a "Get Well Quick" card to all employees out two days in a row. The card is sent special delivery, and is signed by an executive. At the end of the third day a "surprise kit" is sent with fruit, magazines, books, and novelties. It takes a hard-boiled worker to stay out in the face of such tactics, and if he is sick, the plan helps rather than hurts worker morale.

One factory placed a mirror at the entrance. Over the mirror is a sign reading, "YOU are fighting Hitler and Hirohito today: give 'em hell." Seeing himself in the mirror makes each worker stop to ponder briefly over his responsibility.

To stimulate ideas from workers on improving plant efficiency, one concern, instead of offering cash, gathered together rare items such as an electric shaver, nylon stockings, an alarm clock, camera film and flash bulbs, a home workshop lathe, everything that is hard to get. Workers submitting best ideas won a chance at the grab bag. Other ideas were paid for in cash.

To all workers who have not been absent during the work week, one factory now gives two guest tickets each week for any show in town. Workers must use these tickets on a certain day of the week, anytime from morning until midnight. To accommodate daytime workers, the theater runs an all-night show. This is one of the plant's best and most inexpensive schemes for keeping down absenteeism.

•

Help, Please

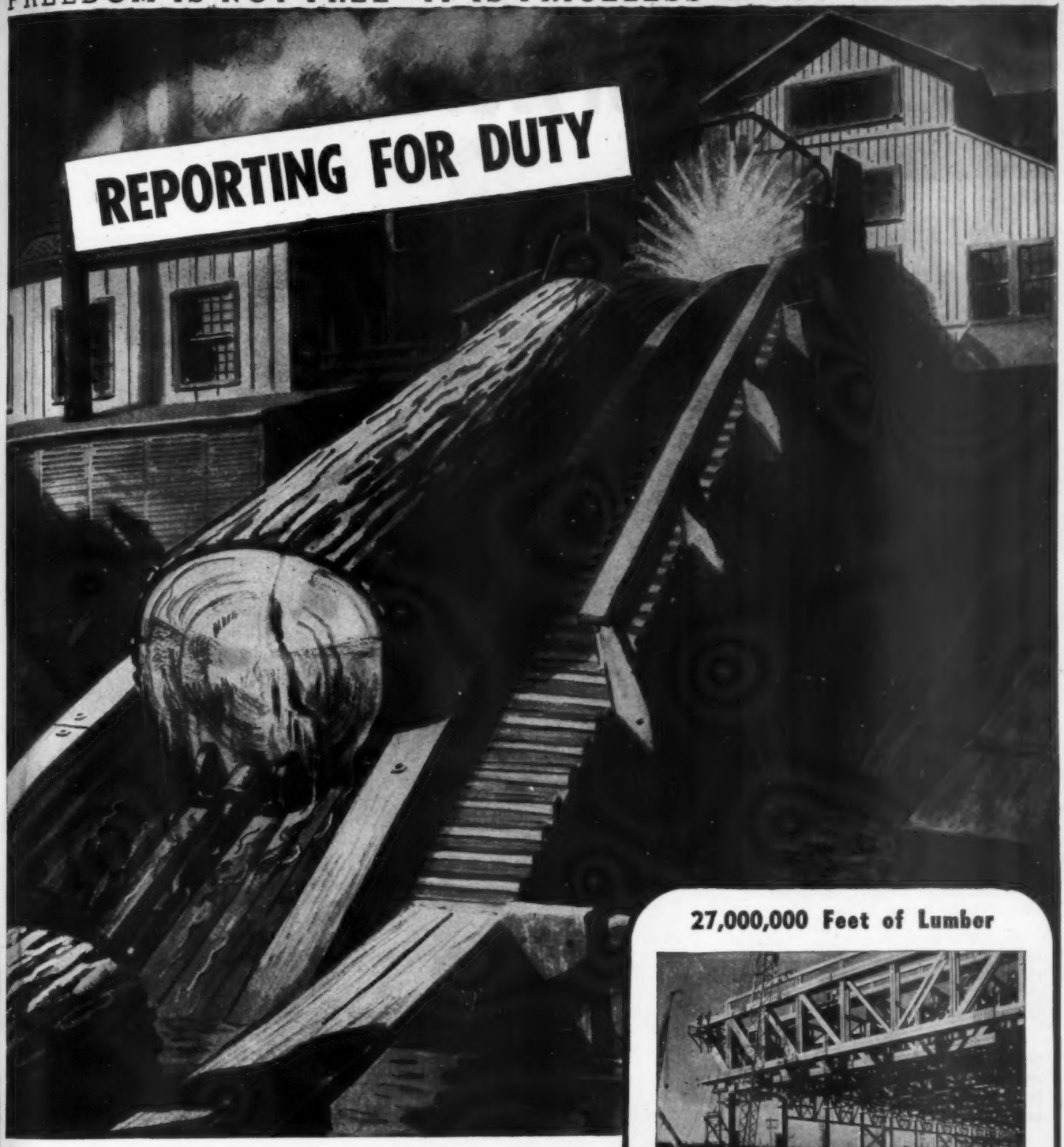
(If you have a solution to the problem set forth below, the inquirer will be glad to know about it. A letter sent to the editors will be promptly forwarded to him.)

We operate a non-ferrous foundry and machine shop and are disturbed by the accumulation in our stores of miscellaneous parts. In addition to the production of our regular line, we do considerable jobbing work, and the parts of which I speak fall in the latter category.

In the production of any article, we increase the size of the order by a safety factor to insure having sufficient pieces to fill the order. If the job goes well, and there are few defective pieces, we are faced with the problem of what to do with the excess. Shall we put them in stock trusting that we shall get a repeat order one day, or shall we throw them back into the furnace and so rid ourselves of the troubles concomitant with carrying them on our records? Though the excess on any one job may not represent a considerable amount of metal, when all the jobs are taken into account, I believe the idle metal may be measured in tons.

What do other manufacturers do? Do they go to the trouble of calculating the cost of storage, the cost of entering the item in their records, interest on the money invested, insurance, rent, and so forth, to determine whether or not storage is economically justified for any length of time? The problem does not resolve itself easily into one of straight economy, in my judgment, particularly in these days of overcrowded production schedules. We

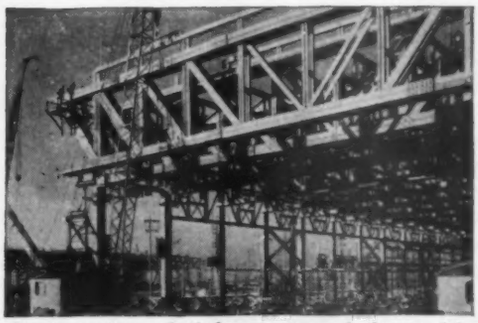
FREEDOM IS NOT FREE—IT IS PRICELESS ★ BUY WAR BONDS



Up from the log pond into the sawmill. Wood is contributing to victory on every fighting front. At home, lumber prefabricated under the TECO Connector System of timber engineering has replaced metal in thousands of heavy war structures such as the aircraft assembly plant shown above. Engineered timber is destined to play a leading role in the reconstruction era to come. You, also, can design in timber with TECO—for strength, durability, and economy. Write today for our literature.

TIMBER ENGINEERING COMPANY
NATIONAL MANUFACTURERS OF ***TECO*** *TIMBER CONNECTORS AND TOOLS*
WASHINGTON, D. C. **PORTLAND, OREGON**

27,000,000 Feet of Lumber

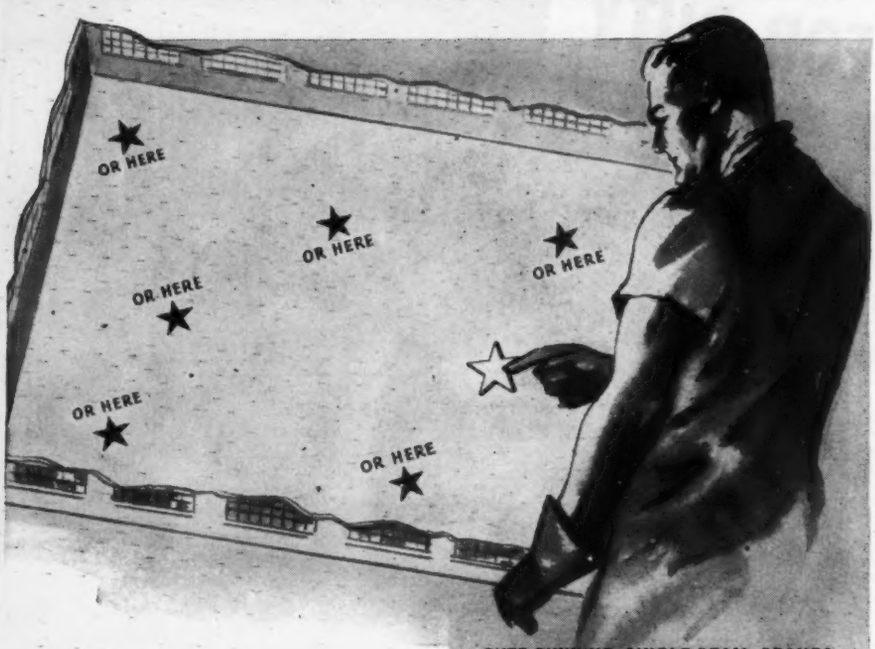


Giant, engineered timber trusses of the world's largest timber-built factory, designed by The Austin Company, of Chicago, engineers and builders.

The ***TECO*** Ring Connector spreads the load on a timber joint over practically the entire cross-section of the woods . . . brings the full structural strength of lumber into play.

WOOD GOES TO WAR — An MGM Technicolor short by James A. Fitzpatrick. Ask your theater when you can see it.

Move it over *Here*

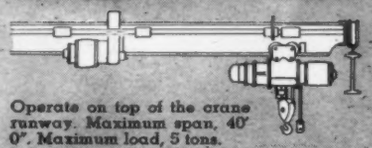


NO extra time for re-handling here. A Shepard Niles Single-Beam Crane covers every square foot of the bay with vertical lifts. Side pulling and dragging of the load is eliminated. The crane covers the length of the bay, while the hoisting unit covers the width. Thus, fast, accurate and economical handling of materials is afforded through Single-Beam Cranes, where conditions do not require, nor clearances permit, installation of a Double-Beam Crane.

Available in over-running, inner-running or under-running construction—with push button, or pendent rope control. Handle all loads from ¼ to 10 tons.

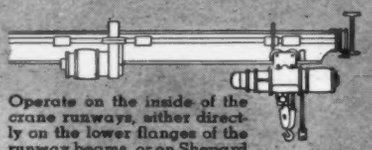
Call in our nearest representative. He will gladly cooperate with you in determining where important materials-handling economies can be made.

OVER-RUNNING SINGLE-BEAM CRANES



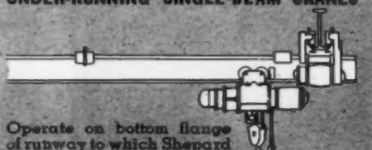
Operate on top of the crane runway. Maximum span, 40' 0". Maximum load, 5 tons.

INNER-RUNNING SINGLE-BEAM CRANES



Operate on the inside of the crane runways, either directly on the lower flanges of the runway beams, or on Shepard Track which has been clamped to the lower runway flanges. Maximum span, 40' 0". Maximum load, 5 tons.

UNDER-RUNNING SINGLE-BEAM CRANES



Operate on bottom flange of runway to which Shepard Track has been clamped. Especially adapted to low head-room areas. Crane runway can be hung direct from roof trusses, eliminating supporting columns, saving vital materials, time and expense. Maximum span, 40' 0". Maximum load, 10 tons.

Write for Bulletin 130

Shepard Niles
CRANE & HOIST CORPORATION
364 SCHUYLER AVE. • MONTOUR FALLS, N. Y.

are all desirous of conserving hard-to-get materials, but once these articles are reduced to ingot, they cannot take shape again except in the orderly sequence of these same overcrowded schedules.

Surely other manufacturers are faced with this same problem, and I'd like to know if they do anything about it, or, as we have done, just tolerate it.

•

Cost of Living Still Going Up

It looks as though the price-fixers are still one jump behind in at least 60 cities over the country. In a recent survey the National Industrial Conference Board discovered that the cost of living for wage earners and lower-salaried workers in April rose in 60 out of 62 cities.

The largest advance, 2.4 percent, was shown in New Orleans, but there was a rise of 2 percent or more in Baltimore, Birmingham, and Newark, and an increase of 1 percent or more in 32 other cities. For the United States as a whole, the cost of living rose 1 percent.

According to the survey, living costs were higher this April than in April, 1942, in all cities for which comparable figures are available. San Francisco recorded the largest increase during the 12-month period with an advance of 10.8 percent. The smallest was shown in Akron, where costs rose only 4.4 percent. The cost of living for the United States as a whole stands 7.1 percent higher than a year ago, and 20.9 percent above January, 1941. In computing these figures, changes in buying habits that have resulted from rationing and war shortages were taken into account.

•

Subcontracting—a Chance for Small Manufacturers

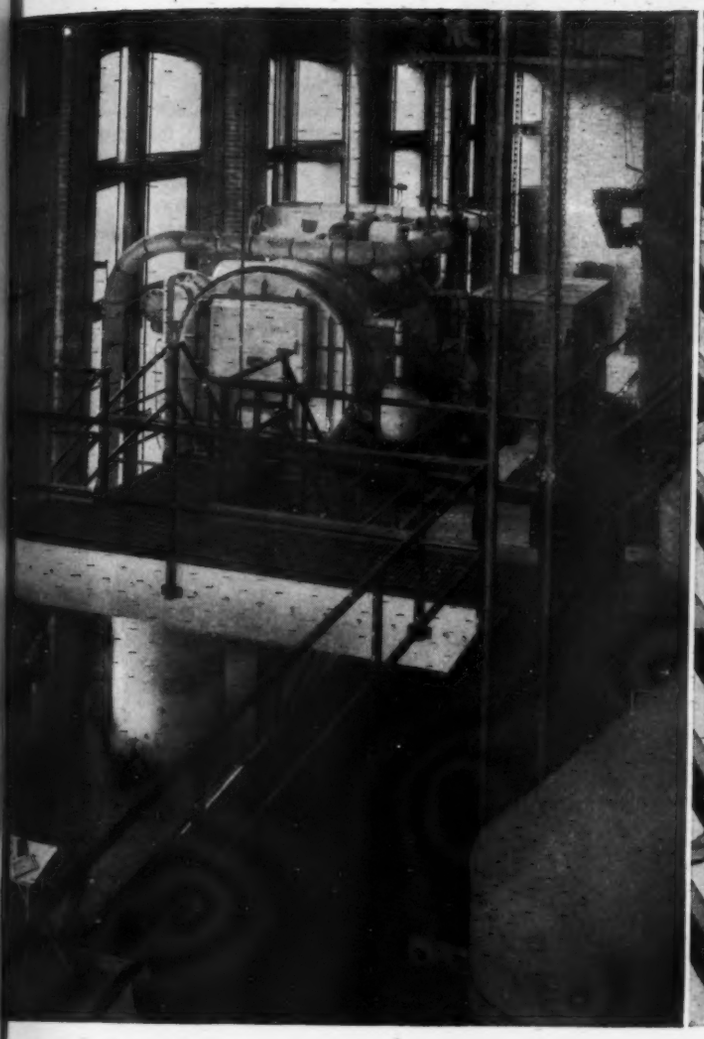
It is in the field of construction that subcontracting has reached its most efficient state, and small manufacturers will do well to study the methods employed by construction contractors when they undertake a big job.

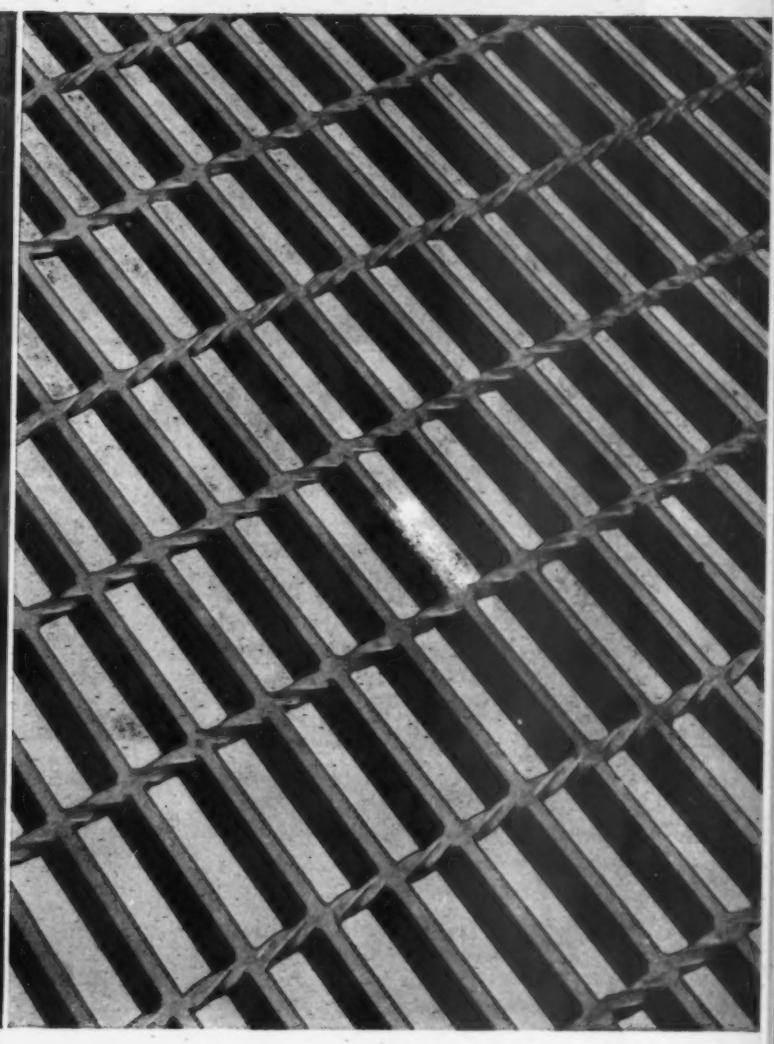
That opinion was expressed by Edward A. Howard, aeronautical engineer and special assistant to the president of Lights, Inc., Alhambra, Calif., in a panel discussion on the problems of small manufacturers recently held in Los Angeles by the American Society of Mechanical Engineers.

"Subcontracting in the manufacturing industry is just in its infancy," Howard said, "and there is wide divergency of opinion as to whether subcontracting is practical in our present machine age."

He then outlined the subcontracting system of his own company. It dates back to 1932, when the organization was confronted with expanding production to fulfill existing contracts. A decision was made then not to expand the manufacturing facilities, but to set up an organization founded upon subcontracting. There were many manufacturers, limited

ON THE GROUND...OR HIGH ON A CAT-WALK
THE TWISTED BAR MEANS SAFETY





SAFE, because the twisted bar prevents slipping... and STRONG, because it's electroforged into one solid piece. Whatever your grating needs, you can depend on Blaw-Knox!

BETTER... 5 WAYS

1. Self-cleaning, no sharp corners to clog.
2. Maximum open area for light and air.
3. Easy to maintain... paint reaches entire surface.
4. Strong electroforged construction means easy erection.
5. Safe footing at all times... with twisted cross bar.

A Catalogue and paper weight size sample will be sent upon request made on a firm letterhead.

BLAW-KNOX STEEL GRATING

BLAW-KNOX DIVISION OF BLAW-KNOX CO.
2031 FARMERS BANK BLDG. · PITTSBURGH, PA.
NEW YORK · CHICAGO · PHILADELPHIA · BIRMINGHAM · WASHINGTON
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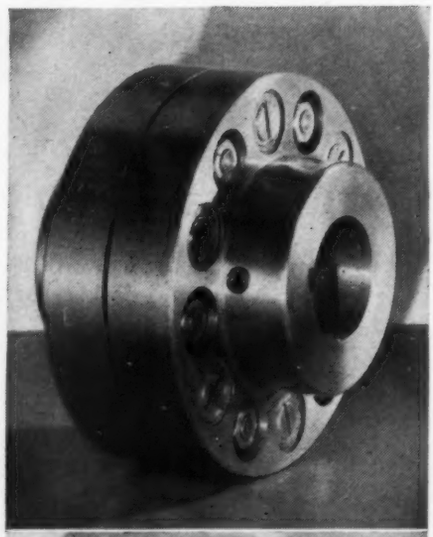
YOU TRY IT...

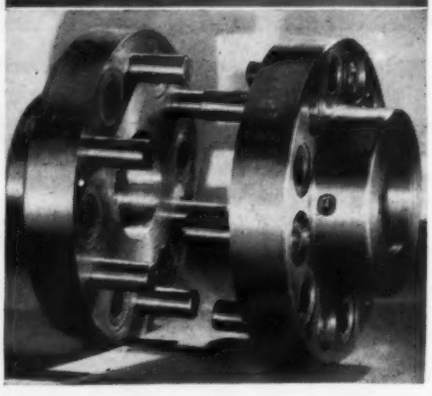
Take a couple of pencils and try to hold them in perfect alignment without touching each other for 10 seconds and see what happens! It will give you a quick demonstration of the fact that it is impossible to maintain perfect alignment between the shafts of direct-connected machines.

Ajax Flexible Couplings provide a positive but resilient connection between driving and driven shafts. They make it possible for each shaft to rotate around its own axis without creating vibration, chatter, strain on bearings, drag, power loss, reversal of torque and other detrimental factors.

Ajax interlocking drive studs held by rubber bushed, graphited-bronze bearings assure maximum flexibility, quiet operation, and complete elimination of lubrication problems.

Make the 10 second "pencil test"—then write for Facts on Ajax Flexible Couplings.





AJAX FLEXIBLE COUPLING CO.

Incorporated 1920 **WESTFIELD, N. Y.**

in scope, with the physical capabilities fulfilling production needs, but lack industrial, business, and manufactu supervision. The system started by Li made it possible for them to become es tial links in a chain of endeavor th could compete with the large, integra manufacturers.

"The primary problem of all sm manufacturers is the obtaining of a produ to manufacture which is suitable to h organization and equipment," Howard co tinued. "The obtaining of the contrac however, is but one of the smallest ad vantages to the subcontractor, as with th present war situation the procuring o materials and equipment is of paramou importance . . . The facilities of our re search department, electrical laboratory an chemical laboratory are available to al cooperating organizations . . . A point t be borne in mind is that no subcontracto should ever be allowed to take a jo at a figure that will not show a profit t him. The only way to keep the sub contractor—or any other employee—happ is to see that when the job has bee completed, he has made his fair share o the deal."

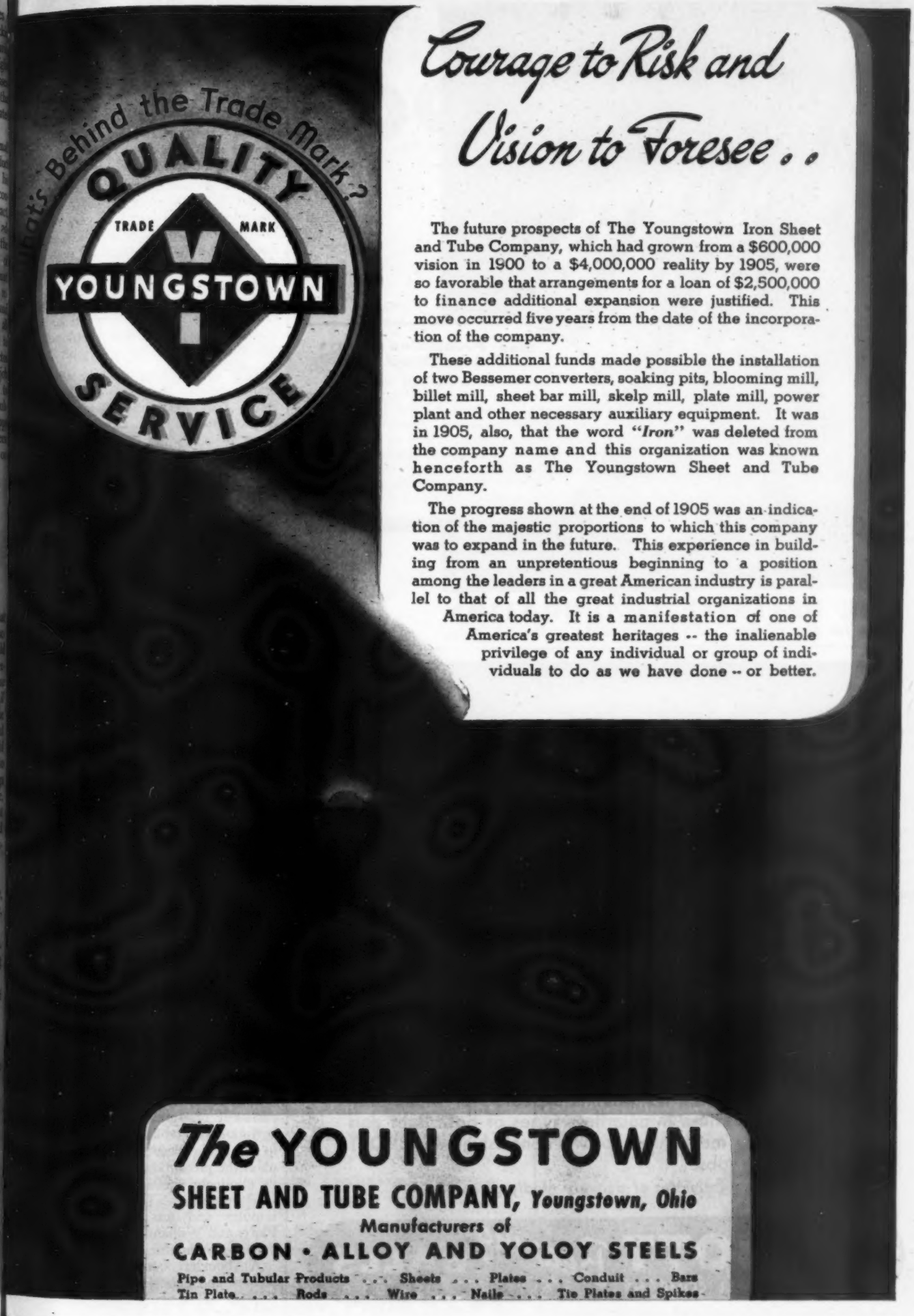
•

What Qualities Does a Good Executive Need?

What makes a good executive? Wha qualities should a man have to be a suc cessful leader of men? According to Harold V. Coes, president, ASME, and vice president of Ford, Bacon & Davis, there are 14 points—or qualifications—which, if one man possessed them all, would make a just-about-perfect executive. Coes pointed out, however, that no one human could have them all. He said: "The problem is to select the individual who, other things being equal, such as training, experience, background, skill, possesses the greatest number of the requisite qualifications, and then develop in him to the greatest extent possible the qualities he lacks."

The 14 points are:

1. Character—that is, honesty, integrity, loyalty, truthfulness, fairness, tolerance, firmness.
2. Orderliness, in mind and in action.
3. Poise, control of temper—he must not be a "desk pounder."
4. Respect for the value and use of time.
5. Ability to assume responsibility.
6. Ability to cooperate.
7. Ability to take and give constructive criticism.
8. Ability to compromise when compromise is necessary.
9. A sense of humor.
10. Broadmindedness.
11. He must not be a procrastinator.
12. He must understand it is no sign of weakness to seek help from others.
13. He must have clarity of thought, be able to reason from facts, draw sound conclusions, then act.
14. He must have sound judgment. At times he must make decisions quickly,



Courage to Risk and Vision to Foresee . .

The future prospects of The Youngstown Iron Sheet and Tube Company, which had grown from a $600,000 vision in 1900 to a $4,000,000 reality by 1905, were so favorable that arrangements for a loan of $2,500,000 to finance additional expansion were justified. This move occurred five years from the date of the incorporation of the company.

These additional funds made possible the installation of two Bessemer converters, soaking pits, blooming mill, billet mill, sheet bar mill, skelp mill, plate mill, power plant and other necessary auxiliary equipment. It was in 1905, also, that the word "*Iron*" was deleted from the company name and this organization was known henceforth as The Youngstown Sheet and Tube Company.

The progress shown at the end of 1905 was an indication of the majestic proportions to which this company was to expand in the future. This experience in building from an unpretentious beginning to a position among the leaders in a great American industry is parallel to that of all the great industrial organizations in America today. It is a manifestation of one of America's greatest heritages -- the inalienable privilege of any individual or group of individuals to do as we have done -- or better.

The YOUNGSTOWN
SHEET AND TUBE COMPANY, Youngstown, Ohio
Manufacturers of
CARBON • ALLOY AND YOLOY STEELS
Pipe and Tubular Products . . . Sheets . . . Plates . . . Conduit . . . Bars
Tin Plate . . . Rods . . . Wire . . . Nails . . . Tie Plates and Spikes

Stop Production Delays Caused by Hard Water

Serious shutdowns due to hard water problems can be avoided with properly conditioned water. Wherever water is heated, wherever soap or soda is used, wherever there is a boiler, you need conditioned water. Refinite softeners, filters, and other water-conditioning units will give you the conditioned water you need.

THE REFINITE CORPORATION

Write for free catalog 101 Refinite Bldg. Omaha, Nebr.

EAT-UP "TOUGH JOBS" • ABBOTT

BEARING BALLS do what is expected of them. The daily applications in countless types of both light and heavy duty mechanisms prove conclusively—ABBOTT for "tough jobs."

Estimates of delivery gladly given

ROLL ON ABBOTT Bearing BALLS

THE ABBOTT BALL COMPANY HARTFORD, CONN. U.S.A.

without the process of logical reasoning acting on a "hunch."

Coes also issued some don't's for management:

Don't have confusion between line and staff duties. Staff officers should not give orders to subordinates of line officers.

Don't have overlapping authority, with two or more executives having control of the same business function.

Don't give responsibility without adequate delegation of authority. Some executives will delegate responsibility but not authority, "through fear that someone will be more important than they."

Don't cut across organization lines in giving orders.

Don't put a man in a responsible position because you like him, regardless of whether he is competent, trained, and has the character for the job.

Top management has the job of coordinating the forces generated from the three basic economic elements—men, markets, and money. Competent management must have a good workable understanding of these elements, and the forces released, and know how to guide the business so as to maintain equilibrium.

"Sometimes it appears as though satisfaction of the demands emanating from these three basic elements were irreconcilable," Coes continued. "In a country such as ours, free enterprise supports us all, the government functioning as the referee of the rules prescribed for the conduct of the game of business.

"Unfortunately at times the referee forgets he is a referee and proceeds to run with the ball, and that causes confusion . . .

"It is management's job to so conduct business as to keep these forces in balance . . . The formula for doing this is quite simple. Increased purchasing power is derived from increasing production and lowering costs and prices through reinvestment in facilities, research, management methods, thereby increasing the productivity and earnings of men and facilities."

•

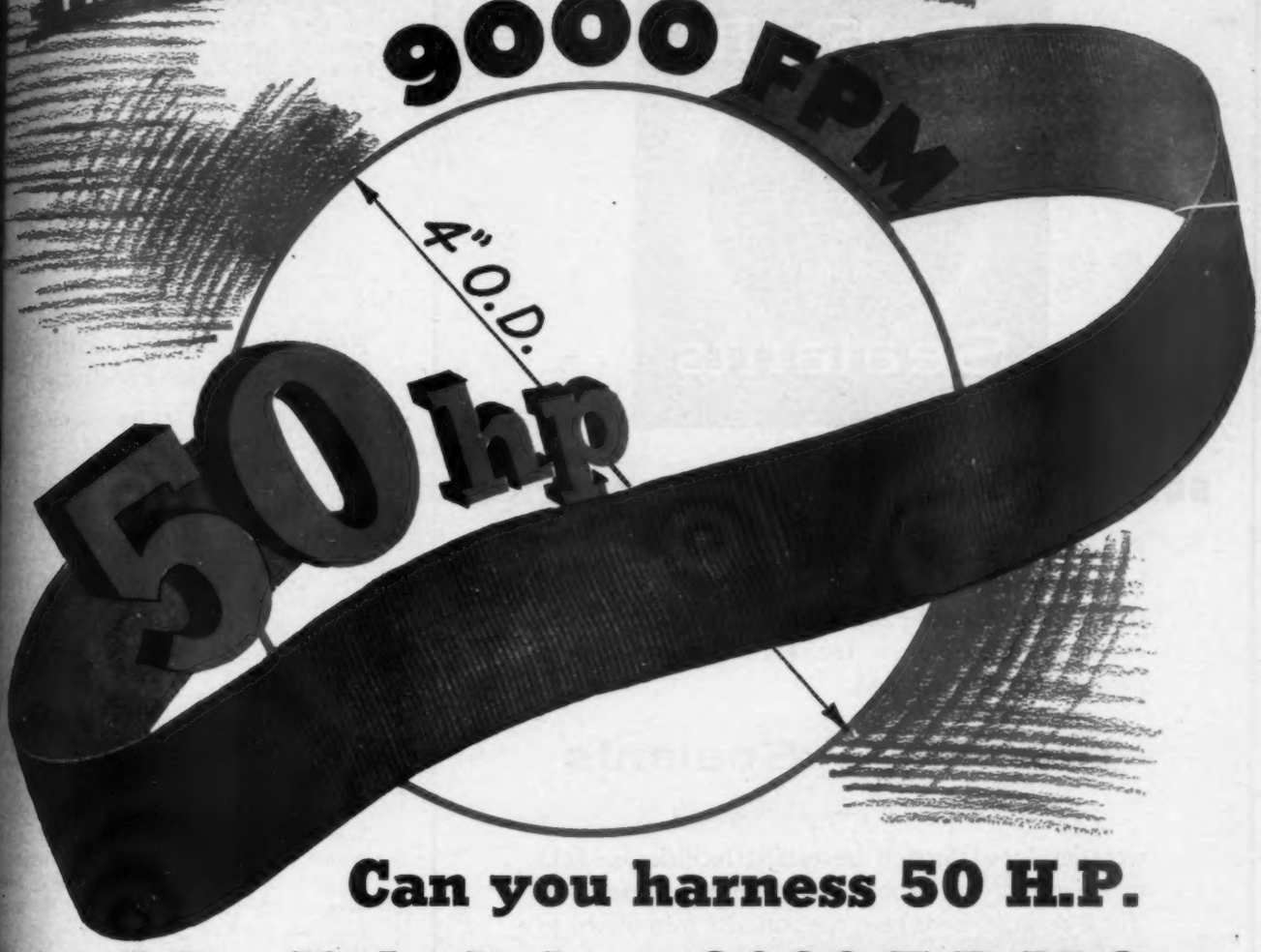
Canning the Victory Crop

Millions of Americans who are going to do their own canning this fall will want to see the full-color sound picture "Canning the Victory Crop." Produced by *Good Housekeeping* magazine as a contribution to the government's food conservation program, this 16-mm. film is being loaned without charge to industrial concerns and other organizations.

Canning methods approved by the Department of Agriculture are demonstrated by home economists who have specialized in this field. Particular emphasis is placed upon the precautions which must be taken to eliminate spoilage and the danger of food poisoning. The film runs about 25 minutes and was produced by Grant, Flory, and Williams. Frank Singiser, noted news commentator, is the narrator.

A booklet containing time charts, recipes, and detailed instructions for "putting up" all kinds of fruits and vegetables

PROBLEMS THAT COME TO GILMER...



Can you harness 50 H.P. with a light belt at 9000 F.P.M.?

An important commercial alcohol company had a centrifuge which was belt driven by a 50 H.P. motor. Belt speeds reached 9000 F.P.M., and no known belt lasted more than a few hours. The customer was ready to believe that belts couldn't handle the job.

Gilmer's men took a look at the job and installed an 8" Hevaloid* Belt, 126" long. Today, Gilmer Hevaloids are lasting for months... where all other belts failed in hours.

The same ingenuity which is solving belt problems all over the country, also has planned an important FREE war-time service to Industry. It's the Gilmer National Power-Recovery Plan, approved by WPB to save power in the following services: Steam, Gas, Water, Electricity, Mechanical Transmission, Boilers, Compressed Air, Refrigeration and Prime Movers. Write for your FREE copy today, and also ask for Gilmer's Handy Belt Selector... a mine of information on modern beltings.

L. H. GILMER CO., Tacony, Phila. 35, Pa.

***A WORD ABOUT GILMER'S HEVALOID BELTS:**

Hevaloid Belts are made by a patented process, exclusive with Gilmer in the United States. It is a neoprene impregnated endless cotton belting, in which latex penetrates every fibre of the cotton and stays there for the life of the belt. Lightweight Hevaloid Belts are smooth and vibrationless at high speeds, resist heat, oil, stretch and slippage... yet have shock-absorbing qualities for low-speed operation. This is an exclusive Gilmer Product.

USE WHAT YOU LOSE

Gilmer BELTS

The Oldest Firm of Rubber Fabric Belt Specialists

V-Belts (F.H.P. & Multiple); Flat Belts; Round Endless Belts; High Speed Belts; Fabric Belts; Planer Belts; Special Endless Belts

SEALING SPECIALISTS *for* INDUSTRY

For more than half a century, Babbitt specialties have been internationally known throughout industry. In the field of scientific sealants, one of the foremost names has been Namco, Inc. These two well-known names are now combined.

Babbitt *Plastic* Sealants

Joint and Gasket Compounds

were developed through the research facilities and field experience of the Babbitt and Namco organizations. These sealants have been scientifically formulated to hold steam, water, oils, and other liquids, chemicals, solvents, and gases, yet retain permanently workable joints.

Throughout industry there are countless applications for Babbitt Plastic Sealants in plant maintenance, on operating equipment and for "on product" use. Since Babbitt Sealants never "cement" a joint, speed and efficiency in pipe line maintenance are increased, and valuable savings in manpower and material are made possible.

If you have a sealing problem of any kind, the chances are that there is a Babbitt Plastic Sealant to solve it.

THE STORY OF SEALANTS: *This new, 12-page book describes the development of Babbitt Plastic Sealants, their uses and applications. Write us on your letterhead for a copy.*

Babbitt
All Over the World

BABBITT INDUSTRIAL SPECIALTIES CO.

International Building
Suite 3151, 45 Rockefeller Plaza, New York

will be made available at cost to use in conjunction with the film. Large four-color photographs for poster or window display purposes are furnished on request. For those wishing to see the film in advance, a showing is being made twice a week in a New York studio. Requests for information or for loan of the film should go to Donald L. Curtiss, Good Housekeeping, 959 Eighth Ave., New York.

The program has been approved by the WPB, the OCD, and the National Victory Garden Institute.

•

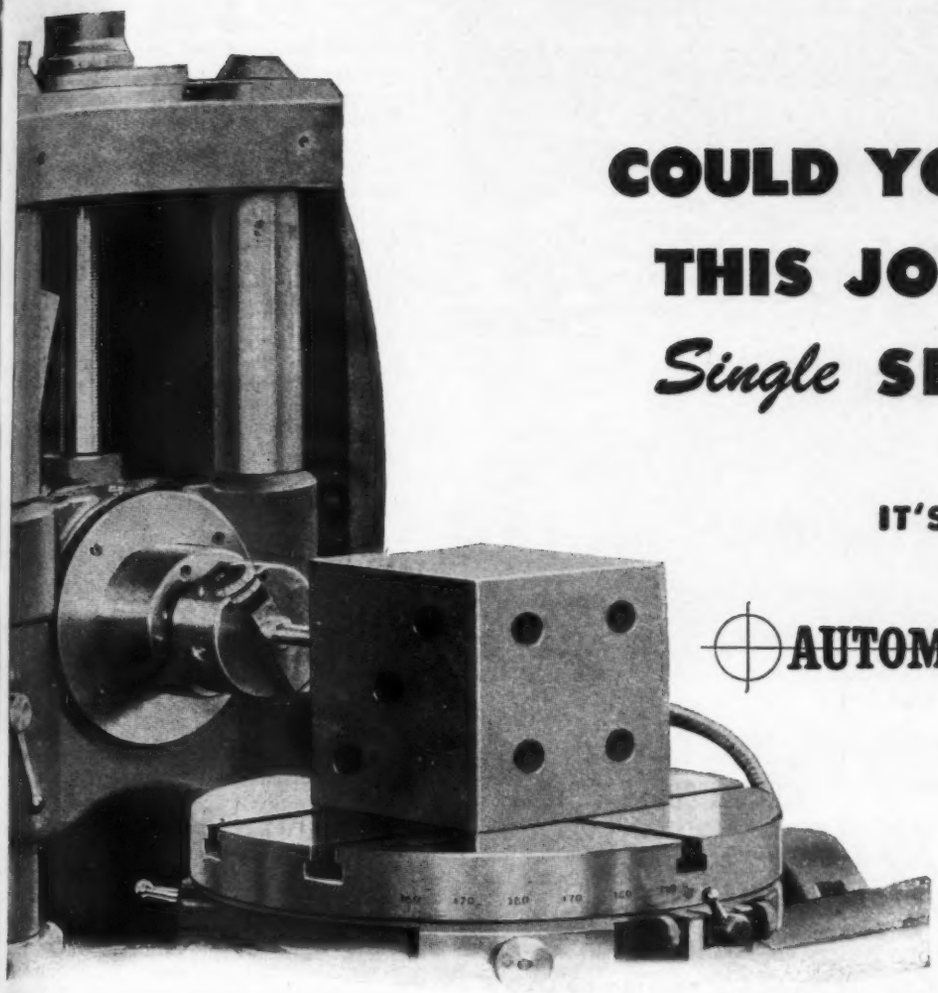
New Protective Coatings Use Domestic Products

Reformulation of ten types of protective coatings for civilian use, including industrial maintenance paints, is now in progress in the paint and varnish industry to conform with WPB Conservation Order No. 332, effective July 1, designed to conserve all types of drying oils used in the manufacture of these materials, except mineral oil and tall oil, a byproduct of pulp production. The order makes mandatory the reduction in the number of pounds of oil that can be used in a gallon of material, and is expected to save approximately 80,000,000 pounds of oil yearly without affecting the satisfactoriness of the respective finishes.

In commenting on the order, the New York Paint, Varnish, and Lacquer Association points out that paint industry chemists and production managers have long anticipated the necessity for the most economical use of drying oils, because of the growing demand for fats and oils for edible purposes in the wartime food program. From the very outset, imported drying oils such as tung, oiticica, and castor, were curtailed, and the limited quantities now available are only for strictly military or high-priority purposes. Soya bean oil is also under direct control. The paint industry thus became increasingly dependent on linseed oil produced from domestic flax, and this, too, is subject to the 50 percent base period use as stipulated in Conservation Order F.D.O. 42, because a substantial portion of the largest crop in history may be diverted to edible products.

Early in the war, also, the synthetic resin coatings were also restricted to military and high-priority purposes, because of the non-availability of the raw materials used in the manufacture of the resins.

In view of the wartime challenge to meet the needs of the military establishment for protective coatings of every type and yet maintain an adequate supply of proper paints for essential civilian purposes, the paint chemists and research laboratories have achieved remarkable results, according to the New York association. It has been possible to work out formulations for protective coatings to conform to the latest drying oil conservation order, which have been carefully tested by individual manufacturers, by the



COULD YOU BORE THIS JOB IN A *Single* SET-UP?

IT'S A *"Natural"* WITH THE AUTOMETRIC MODEL B

The illustration shows a typical time-saving operation on the Autometric Model B. All of the holes in all four sides or at various angles in a box jig or production part are produced with one clamping of the work piece.

Its ability to handle a complete job in a single set-up—more rapidly and accurately than ever before—makes the Autometric Model B indispensable equipment for the precision boring of a wide variety of parts.

Model B Autometric Features:

- Errorless measuring — more rapidly, more accurately — by the Autometric method.
- Infinite variation of spindle speeds by finger tip control.
- Infinite selection of feeds by finger tip control.
- Hardened — ground — and super-finished steel ways.

Write for complete information on the Model B Autometric Jig-Boring Machine.

Buy Victory . . .
WITH AT LEAST 10% IN WAR BONDS

Rotary Head Milling Machine
•
Autometric Jig Borers
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Kearney & Trecker *Products*
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SCHRAMM is always out in the lead in the compressor field. A name that is written on every important development and contribution to compressor history. The more recent developments that keep SCHRAMM out in front include; lightweight at all points of moving contact . . . uniform expansion of all metals subject to heat . . . perfect timing . . . ruggedness without excessive weight . . . perfect balance.

Sizes 25 to 600 Cu. Ft. displacement

WRITE FOR CATALOG 42-S

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★ RUGGED BEARING SUPPORT

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SCHRAMM, INC.

THE COMPRESSOR PEOPLE

WEST CHESTER, PENNA.

National Paint, Varnish, and Lacquer Association's scientific section and by the National Bureau of Standards. They have been approved by the Protective Coatings Section of WPB and the Office of Price Administration as entirely satisfactory for the purposes for which the respective finishes are to be used in the protection and preservation of property.

The reformulated paints, varnishes, and enamels should, of course, be applied in strict accordance with the directions of the manufacturers, and, in view of the changes which are being made and possible further changes which may be necessitated in the months to come, it is suggested that industrial maintenance paint users consult the manufacturers of brands they have been using, and obtain their current recommendations for types of coatings best suited to the work contemplated at the time.

•

Negroes Are Finding More Jobs in War Industries

More and more Negroes are being used in war plants throughout the country, according to figures recently released by the War Manpower Commission. Of the 12 million workers employed in establishments reporting to the U. S. Employment Service in July) 1942, 5.8 percent were Negroes; in March, 1943, the percentage was 6.7.

This increase has been uneven, slight in some war industries, marked in others. The number of Negroes at work in tank factories more than doubled during the period reported, although total employment in that industry grew only 31.3 percent.

In the aircraft industry, Negro employment increased 96.1 percent in comparison with a total employment increase of 35.4 percent. In shipbuilding 62.8 percent more Negroes were employed in November than in May, 1942.

War Manpower officials point out that in March, 1943, Negroes comprised only a fraction of 1 percent of the total employment in the fireworks and pyrotechnics industry, and less than 2 percent in the manufacture of electrical equipment for industrial use, metal-working machinery, and scientific instruments. In secondary smelting and refining of non-ferrous metals, however, they comprised 30.1 percent of total employment; in bituminous coal mining 23.1 percent; and in blast furnaces, steel works, and rolling mills, 12.2 percent.

Although the local offices of the USES have materially aided in forwarding the WMC program of the utilization of Negroes in war jobs, the increased employment does not represent an adequate utilization in some areas and some plants. The proportion in war industries is not yet commensurate with their proportion of the labor force. Three reasons are stated: (1) Geographic distribution of the Negro labor force in relation to geographical distribution of war contracts; (2) limited occupational and training opportunities; (3) race prejudice.

Two-thirds of the Negro labor force, according to WMC officials, is confined to 14 Southern states, whereas only 13.5 per-

Sanymetal*

LOCKERS

OF PRESSED HARD FIBREBOARD
AVAILABLE IN SINGLE AND DOUBLE TIER TYPES

By utilizing Sanymetal Lockers you may obtain these advantages: SAVE TIME AND MONEY: Standard types and sizes available for prompt shipment. No need to design or build makeshift compartments. PROTECTION, CONVENIENCE AND SANITATION in an unusual degree because of rigid, reinforced construction. QUICKLY ASSEMBLED INTO INSTALLATION: Assembly of sides and pilasters and most of hardware before shipment reduces installation time. WARTIME RANGE OF TYPES AND SIZES to meet requirements of 10 or 10,000 employees.

Write for Bulletin No. 920 for complete data on Sanymetal Lockers or send blueprints of layout for quotation.

Sanymetal* Asbestos Board Toilet Compartments

complete with door hardware and partition fittings

NOW AVAILABLE — READY TO INSTALL

..IT ESCAPES YOUR GUARDS— laughs at barbed wire fences—

. . . and runs scot-free throughout your plant. No plant protection system, however well organized and concealed will stop the silent and production retarding influence of minor illness of employees; it interferes with and slows up production.

No one disputes the fact that healthy, contented employees do better work — that disgruntled employees are halfsick already. Yet many plants, neglecting toilet and washroom facilities, invite irritation, premature fatigue and resentment, irregular habits, and high labor turnover among both men and women employees.

An installation of Sanymetal Asbestos Board Toilet Compartments, by providing utmost convenience, personal privacy and an exceptionally high degree of sanitation, removes a common cause of ill feeling and protects the health and well-being of all employees. Now available, Sanymetal Asbestos Board Toilet Compartments are the result of exhaustive and thorough testing of suitable materials for toilet compartments. Sanymetal Engineers selected Asbestos Board as the least critical material meeting every requirement. Consisting of cement-asbestos boards laminated to a center core, Asbestos Board provides a strong, rigid structural material that is highly resistant to moisture, fire and wear. In addition, Sanymetal Asbestos Board Toilet Compartments will bring you these advantages:

SAVE TIME AND MONEY: No need to design or attempt to build makeshift toilet compartments. Sanymetal Specialists have worked out wartime toilet compartments of economic design that are being made from non-critical materials, available today and furnished complete with door hardware and partition fittings.

CONVENIENCE AND SANITATION: These are embodied in Sanymetal Asbestos Board Toilet Compartments in a degree unappreciated and unapproached, and usually overlooked by those lacking Sanymetal's 27 years of specialized experience in this line.

SUITABLE MATERIAL AND ENGINEERED FEATURES: Flush Type Asbestos Board Toilet Compartments are made of a rigid, structural material, formed by laminating cement-asbestos board to a core which provides a strong, rigid installation and is moisture, fire and wear resistant. Free from dirt-collecting pockets and ledges, these compartments are easy to keep clean.

ONE ORDER — ONE PRIORITY, COVERS THE DELIVERY OF EVERYTHING YOU NEED, even complete door hardware and partition fittings, so that you can proceed to complete the installation without the slightest delay.

COMES READY TO INSTALL without trial erection or aggravating attempts to assemble materials.

Allow neither neglect nor inadequacy of toilet and washroom facilities to impede or retard production of war goods. Safeguard the health of your workers.

Write for complete data on Sanymetal Asbestos Board Toilet Compartments. But for quick action, see "Partitions" in your phone book for local Sanymetal Representative.

THE SANYMETAL PRODUCTS CO., INC., 1707 URBANA ROAD, CLEVELAND, OHIO

* TRADE MARK REG. U. S. PAT. OFF.

Sanymetal

TOILET AND OFFICE PARTITIONS

THE SANYMETAL PRODUCTS CO., INC., 1707 Urbana Rd., Cleveland, O.

Please rush by return mail your new Bulletin on:

....Sanymetal Asbestos Board Toilet Compartments

....Sanymetal Pressed Hard Fibreboard Lockers — Bulletin No. 920

Name.....

Position.....

Firm.....

Address.....

City.....*State*.....

No adjustments necessary in a West-serviced plant

Today, the increased demands of war production have further proven the worth of West products, even when tested against the new problems created by the employment of women workers in heavy war industry.

LAN-O-KLEEN* for healthier hands

Lan-O-Kleen is a double-action corn-meal soap, impregnated with emollient lanolin. First, it removes virtually all types of dirt and grime—*without getting tough about it.* Then it "Work-Conditions" the hands by putting on an oil similar to natural skin oils. Lan-O-Kleen helps nature to maintain a normal, healthy skin condition.

WEST PROTECTIVE CREAMS

As a result of many articles on the subject, women workers are more than ever aware of the wisdom of using protective creams as an added precaution against dermatitis. But it is in the interest of management to provide workers with the PROPER protective cream—one that the West laboratories have prepared after careful research to best combat the hazards of dermatitis aggravated by those specific irritants peculiar to the various materials handled.

Write for literature on these products or request that a West representative call to see you.

55 BRANCHES • HELPING TO GUARD INDUSTRIAL HEALTH • COAST TO COAST

*Trade Mark Reg. U. S. Pat. Off.

WEST DISINFECTING Company

42-16 WEST STREET • LONG ISLAND CITY • N. Y. • Dept. J.

cent of the total war contracts have been awarded in these states.

Discriminatory practices are responsible for the failure of some war industries to employ Negroes in proportionate numbers. The fact that relatively few have had industrial experience, and even fewer have had either training or experience in skilled occupations, hampers their employment as well. Employment of large additional numbers of non-white workers calls for an extensive training program. Many are receiving training for jobs in shipbuilding, aircraft manufacturing, and munitions industries. On March 31, 1943, non-white enrollments in pre-employment training courses of the Vocational Training for War Workers program were twice as great as a year ago. Enrollments of Negroes attending Office of Education supplementary courses, open to employed war workers, tripled during the year.

•

Drafting of Skilled Men Imperils War Production

If all physically fit industrial workers and executives under 38 years of age are drafted into the armed services there will be a serious curtailment of essential war production, according to the results of a survey of 212 representative companies engaged in war contracts. The survey, made by the National Industrial Conference Board, reveals the critical manpower situation which industry will face if the withdrawal of all types of employees, especially those of advanced skills and technical and supervisory status, continues.

Of the 212 companies surveyed, representing approximately 650,000 workers, three-fourths are currently engaged 100 percent in war production. One-half of these companies are already seriously concerned by the effect of such withdrawals.

Especially significant are the figures given by companies showing the number of additional men under 38 whom they can relinquish to the armed services without endangering their war production schedules. Replies were made on the basis of grades of employment ranging from unskilled through skilled, technical, supervisory, and executive. Further loss of manpower would be felt most seriously in the executive class, according to 60 percent of the companies, which stated that no further withdrawals can be made from this group without gravely hampering production. More than 50 percent of the companies stated that no further withdrawals from either supervisory or technical groups could be made without retarding production schedules. Less critical would be the loss of men from the skilled and unskilled grades. In the former grade, 29 percent of the companies indicated that no additional losses of manpower could be made without serious effect; only 16 percent reported that no further demands could be made on their unskilled workers without injury to production.

Not a single company stated that it could continue to maintain production schedules with a loss of all employees under 38 (except unskilled). Several asserted that if this should occur, their plants would be

№ 170 TYPE DEOXIDINE

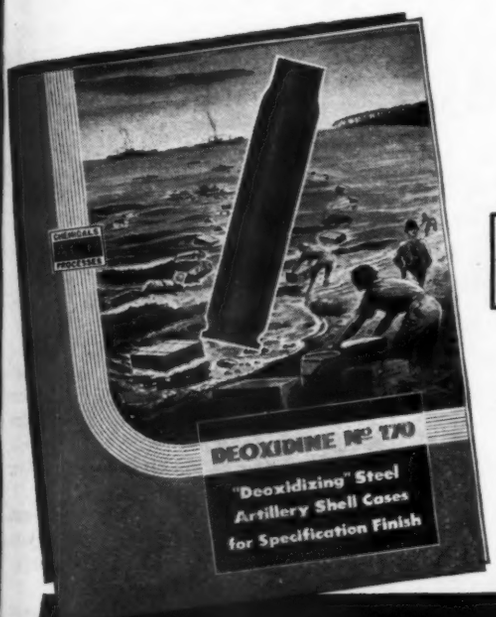
For GREATER EFFICIENCY

in Preparing Steel and Aluminum Ordnance Parts For Varnish and Paint Finishes...

DEOXIDINE #170, admirably suited to the processing of steel shell cases, is but one of a number of grades of ACP acid cleaners. The immersion process in which it is used is adaptable to the cleaning of many other ordnance or marine parts. Other grades of DEOXIDINE are available for brush or spray processes where these are indicated for expediting production.

DEOXIDINE #170 is a chemical that removes light oil, annealing scale and eradicates rust and rusters, producing a clean, minutely-etched, paint-receptive surface. The rusters, even though invisible, are destroyed, eliminating the possibility of defects developing beneath the protective finish. DEOXIDINE does not produce a coating on the cleaned surface which on shell cases, for example, might crack in crimping and in obturation and ruin the protection of the final finish.

DEOXIDINE meets U.S. Ordnance Department requirements for its efficiency in removing rust and neutralizing rust producers before protective finishes are applied.



CHEMICALS ACP PROCESSES

Manufacturers of Inhibitors & Metal Working Chemicals

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"WE WON IT BEFORE—
WE'VE WON IT AGAIN!"

"NOT ALL of us were present back in 1917 when our Company received an Award from Secretary of War Newton D. Baker 'for Distinguished Service, Loyalty, Energy and Efficiency in the Performance of War Work'—but some of us were.

"And the records these Alvey-Ferguson men hung up during the First World War have been a great inspiration to all of us!

"Long before Pearl Harbor we started to break our previous records in turning out conveying systems and metal products cleaning and finishing equipment took on a new and fuller meaning.

"Naturally, we are proud that our work has been recognized and that the Army-Navy 'E' flag 'for excellence in the production of materials for war' flies over our plant.

"We're going to keep that "E" flag flying until Victory is ours—not only on the production front—but on the war front!"

The Men and Women of

THE ALVEY-FERGUSON COMPANY

136 Disney Street A-F Cincinnati, Ohio

Engineers and Manufacturers of Conveying Systems and Metal Products Cleaning and Finishing Equipment

forced to close down. None reported themselves able to maintain production with the loss of more than 75 percent of their technical, supervisory, and executive staffs. Only two companies believed that they could avoid curtailment if they lost more than 75 percent of their draft-age skilled workers.

•

ILO Will Be Needed in Post-War Effort

The work of the International Labor Organization should be supported and strengthened, now and after the war, with a view to attaining through the greatest possible international cooperation the objective so clearly put forward by the authors of the Atlantic Charter—that is, the securing for all of improved labor standards, economic advancement, and social security. This was the declaration made by Eduard Benes, President of Czechoslovakia, at a recent ILO meeting in Ottawa.

"From now on," President Benes's statement said, "We must plan practical solutions and formulate the principles which will assure to all nations military and political security, and to the common man an equitable share in industrial, social and cultural development. To the fundamental rights of man, to freedom of speech and thought, to equality before the law deriving from political democracy—which Nazi barbarism has made us value to the full—will be added new rights as a counterpart to the contribution which each individual owes to the community—the right to work, to health, to educational and professional development, to social security, and to the fullest realization of the individual. . .

"In this evolution, the International Labor Office will play a notable role, because it symbolizes and is able to realize international cooperation in the economic and social spheres."

•

Fuel Prospects for the Coming Winter

There will be no easy road to warmth and comfort—not to mention efficient operation of industrial plants—unless definite steps are taken now to offset fuel shortages, according to the Office of War Information.

Large consumers of fuel oil, those using more than 10,000 gallons a year, must convert their oilburners to coal burners—now.

Users of bituminous coal must order that coal now, give their dealers the greatest possible latitude as to kind, size, and quality, and store as much this summer as their dealers can supply.

The nation's 1943 requirements for soft coal are the largest in history; for anthracite, 1943 requirements are 5 million tons more than 1942 production. To meet these requirements coal must be mined at full capacity every month; coal must be kept moving at full capacity of transportation lines; users must get every ton

then I said to myself—

So . . . the Nazis couldn't sink her!

This 12,500-ton, all-welded tanker "Victoria" was torpedoed amidships. Her deck plates buckled but her bulkheads held. Then, the baffled Nazis smashed a second torpedo into her and left, confident she was finished. But those welds refused to yield—even to Nazi TNT. She made it to port and was repaired—ready for the subs again. Some ship, I say!

Some construction, you mean! This is just one of many welded ships that have refused to be licked by torpedoes. Just like our welded M-4 tanks which withstood the Nazi 88's in North Africa. Ships, tanks, planes and guns—they're all welded for strength as well as for savings in time and materials.

Better products and *lower costs*—just what I want in my business after the war. Then why shouldn't I weld my peace-time products?

You should! You MUST if you plan to survive in the face of war-developed ideas. And believe me, your ship of business will sink or float, depending on how well you can stand up against competition on WELDING ECONOMY. Why not start NOW to learn from Lincoln the latest kinks in welding thrift.

THE LINCOLN ELECTRIC COMPANY, CLEVELAND, OHIO

ACCORDING TO THE RECORD
• The necessity for heating in war plants precipitated a heavy load on the facilities of America's Heating Industry. The millions of workers in Uncle Sam's Army of Production had to be kept warm.
By maintaining an equitable balance between productive capacity and backlog of orders, Fedders has been able to schedule deliveries in accordance with promises. This has smoothed the road of heating men who plan, sell, install and use essential heating equipment. It has come to be a byword that "You Can Count on Fedders."
The Industrial Heating Division of the Fedders Manufacturing Company has made and is continuing to make every effort to produce efficient, reliable unit heaters and heating coils based on sound, metallurgical, engineering and manufacturing skills.
Well-graduated capacities, minimum number of sizes, high efficiency design and close cooperation with men in the field are just a few of the reasons why you will enjoy doing business with Fedders.
FEDDERS MANUFACTURING CO., INC.
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The complete Fedders line includes Unit Heaters, Unit Coolers, Blast Heating Coils, Electric Refrigeration Equipment, Automotive and Aircraft Radiators, Electric Water Coolers.

of bituminous coal they can into bins and stockpiles.

The Petroleum Industry War Council estimates that the nation's crude oil requirements for 1943 will average approximately 3,990,000 barrels a day, and will rise to an average of nearly 4,279,000 barrels a day in the first three months of 1944. To meet these requirements transportation facilities must be stretched to their utmost; fuel oil and gas rationing restrictions must not be relaxed. Heavy military demands may impose even more severe restrictions.

The increased requirements of war plants, plus the decreased availability of other fuels, calls for a step-up in coal production. The Solid Fuels Administration for War, on the basis of surveys by its own and other government agencies and by the industry itself, makes the following estimates of demand for the calendar year of 1943: Approximately 600 million tons of bituminous coal, an increase of 20 million tons above the all-time high reached by the estimated production in 1942, and the largest soft coal requirements in history. Approximately 65 million tons of anthracite coal, an increase of about 5 million tons over the 1942 estimated production.

Balanced against the necessity for increased production are several factors which place a top limit to possible production. Two of these factors are present and continuing—shortage of manpower and shortage of equipment and supplies. A third has been present and could return—it is the factor of a temporary production stoppage.

Many Miners Drafted

Last year the coal mining industry lost approximately 60,000 miners to the armed forces and to other industries. For a while recruitment and replacement held the net number about in balance. Replacements, the mine operators point out, are both difficult and dangerous. The modern mine is highly mechanized. It needs trained men. Many states require certificates before a person can work in a mine. These certificates are evidence of experience and capacity which are gained by serving an apprenticeship, frequently for a period of six months.

Later, the adoption of the six-day week partially compensated, in unit of time, for the loss of men.

Shortages of new and replacement equipment have also placed limitations on possible production. The Solid Fuels Administration for War and the War Production Board are working out plans, jointly, in an effort to meet this perplexing difficulty.

Another factor affecting the adequacy of the coal supply is transportation. Coal must generally be moved as rapidly as it is mined. The coal movement pattern is a complex one. The war is laying tremendous burdens on the railroads, which carry most of the coal, and on which coal comprises the largest load. Coal transportation this winter will require from 225 to 240 million more miles of car service than last winter.

A further factor in guaranteeing an adequate coal supply next winter is distribu-

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Improves Vision • Reduces Personal Injuries • Improves Morale

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WHAT ARE THE RESULTS? Reports from all over the country show a marked increase in production . . . a big reduction in accidents . . . an improvement in employee morale.

Why not get all the facts about this new science of paint? Fill in the coupon below.

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THIS COUPON will bring you further information about the new work-speeding development, "Three Dimensional Seeing." Fill it in now . . . check the items that interest you . . . drop it in your "Outgoing" box.

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Our Secret Weapon!

The minds of your workers are part of Democracy's Production Arsenal. Let them fight, too. Fight with ideas!

In one plant 31,777 ideas were submitted in five months. In another plant, employees' suggestions saved 300,000 man-hours in six months. In another, 1600 ideas out of 7000 were found workable.

The Elliott Service Company, through its Employee Suggestion Plan, has enabled thousands of workers to help their employers — and their country — in this way. The plan is designed to fit in with the War Production Board's request that industry explore the hidden resources that lie in the minds of its workers.

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A tool to help foremen improve their production performance.

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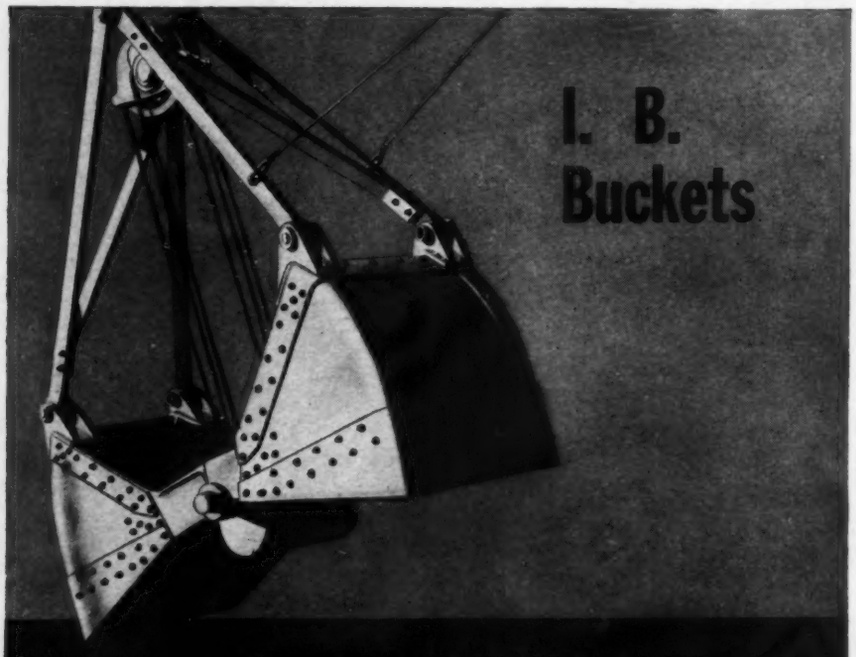
Improves morale. Keeps workers keyed up to war tempo.



Designed and built to handle the tough jobs with ease, I. B. buckets are unusually sturdy. Extra large sheaves reduce rope wear and maintenance. They take big, deep, clean bites. Now available in rope-reeve, power-wheel and link type. For prices and further facts write to INDUSTRIAL BROWNHOIST CORPORATION, Bay City, Michigan. Offices in New York, Philadelphia, Pittsburgh, Cleveland and Chicago.

tion. Here again shortages of manpower and of equipment are handicaps. Loss of labor has cut the manpower of the local coal yard. The necessity to conserve oil and rubber has cut local coal deliveries.

Consumer Cooperation

One of the most vital factors in next winter's coal supply picture is consumer cooperation. Solid Fuels Administrator Harold L. Ickes has said: "Coal must be ordered and users must take delivery as the coal can be supplied. Industry must maintain production by ordering coal now and providing storage space for adequate supplies." The Administrator advised all bituminous coal users that, although the Solid Fuels Administration will do everything within its power to prevent a coal emergency from curtailing war activities, their best insurance policy with coal is their own stockpile.

•

Canada Starts Compulsory Job Transfer

JAMES MONTAGNES, Canadian Correspondent

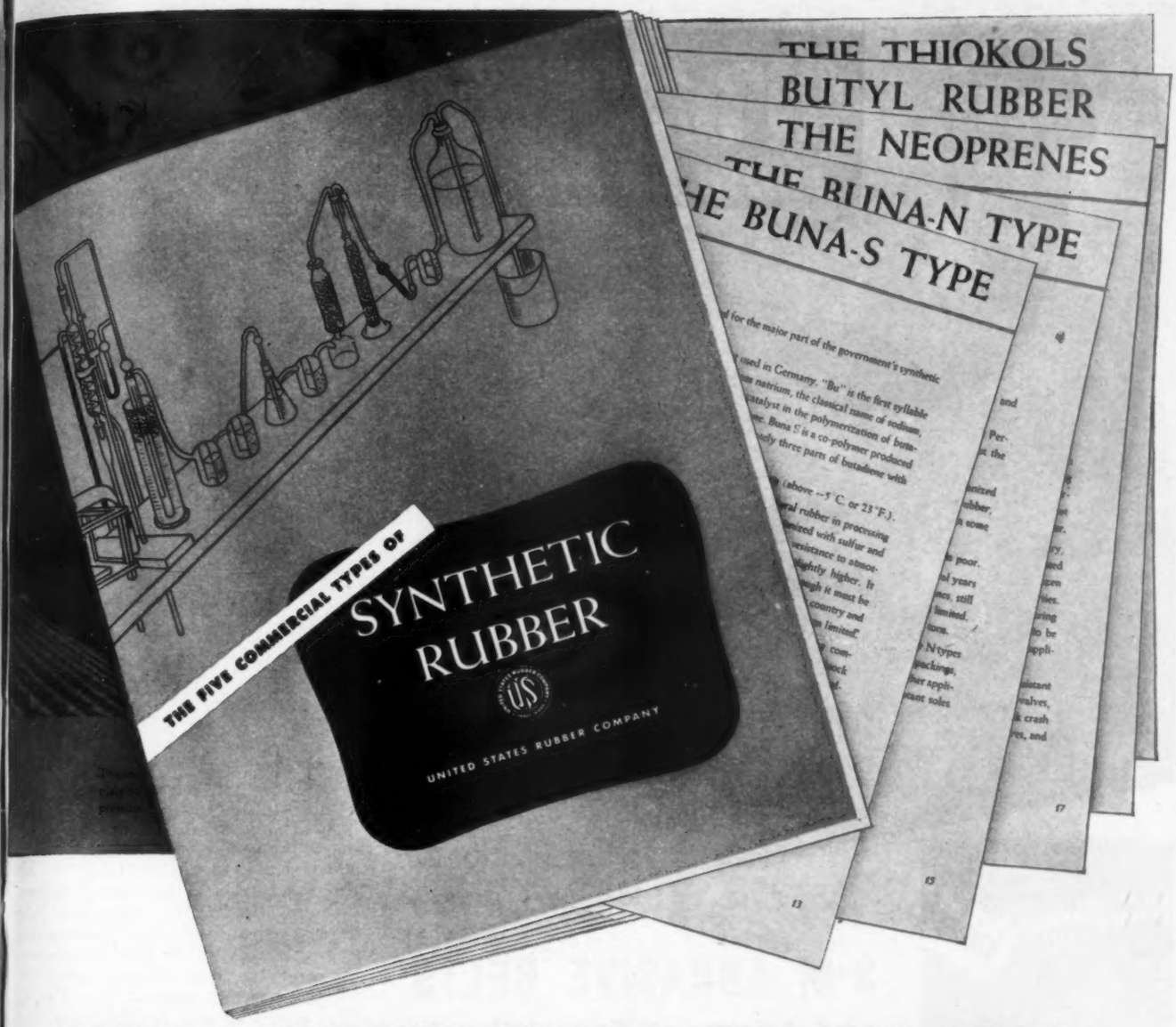
To MEET increasing labor shortages in such essential industries as farming, war industries, coal mining, lumbering, and logging, Canada has now put into effect clauses of its job-freezing order of September 1, 1942, requiring men in non-essential work to register for work in essential industries. By June 15 the first two classes of occupations and non-essential industry workers had to register with their local National Selective Service office, and employers in the listed non-essential industries could no longer obtain men in the military call-up classes to fill the vacancies.

This move is of interest, since Canada froze jobs months before the United States and has led in other wartime civilian economic moves. Whether or not it will be followed here is as yet debatable, but here is how Canada is administering its employment transfer order:

All men between 19 and 25, and all single men, widowers without children, divorced or judicially separated men born between 1902 and 1916 inclusive, are subject to military call-up in the Dominion. Those in these classes who have been found medically unfit for the Army now come under the compulsory employment transfer order.

The National Selective Service of the Department of Labor has announced two classes of occupations and non-essential industries since the beginning of May, men in these occupations and in the military call-up groups having to register and being subject to job transfer as soon as jobs for them can be found anywhere in the Dominion. Married men in the group and discharged soldiers are not to be moved at present from their locality, and discharged soldiers are not to be moved to new jobs until all others have been moved.

Job classifications which have been



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As the supply of natural rubber diminishes, undoubtedly more and more mechanical goods will be made of synthetic rubber... hose, belts, packings, molded goods, tank linings, and other rubber products used by industry.

Having worked in the field of synthetic rubber for more than twenty years, we know what each of the five types will do; what chemicals such as sulfur, carbon-black, or ultra-accelerators must be added, and how to compound them. We work with all five types; use the type available that is best suited for the purpose.

You can get an over-all picture of the properties and characteristics of synthetic rubber in the new book recently published by United States Rubber Company. A request for "The Five Commercial Types of Synthetic Rubber" made on your company letterhead will be filled promptly. Address your letter to Dept. 7

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Listen to the Philharmonic Symphony program over the CBS network, Sunday afternoon 3:00 to 4:30 E. W. T. Carl Van Doren and a guest star present an interlude of historical significance.

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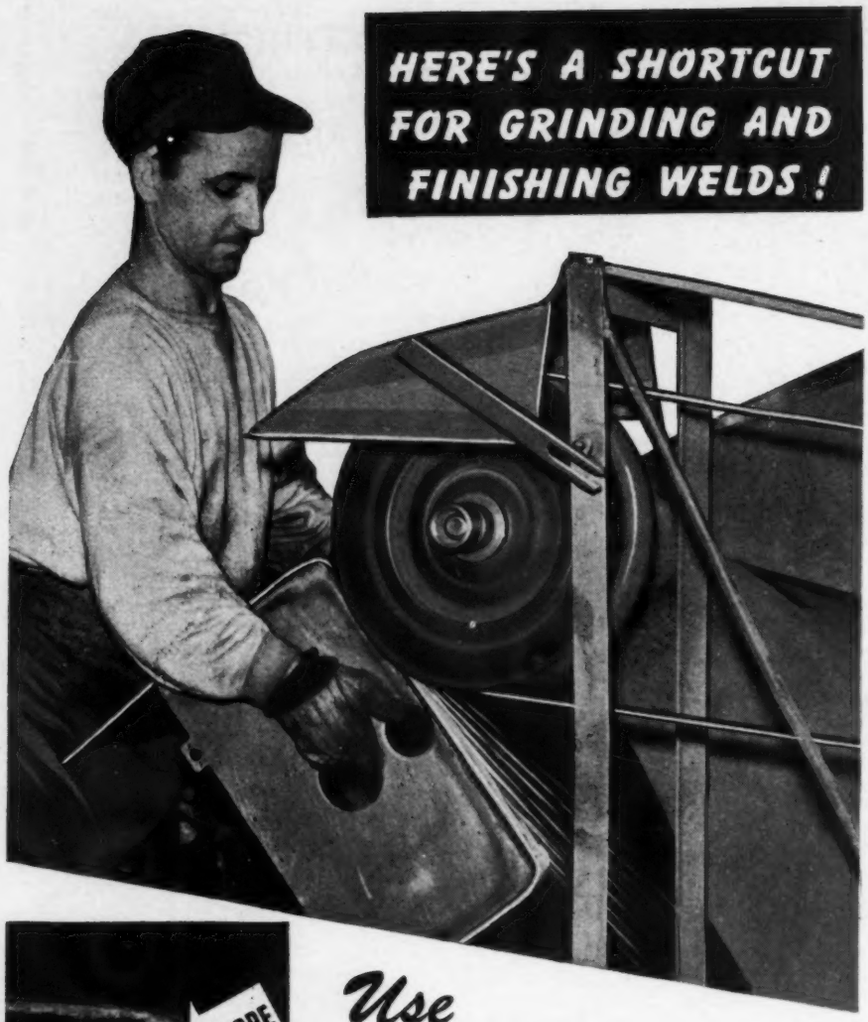

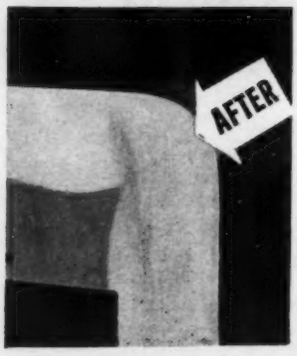

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called on to date include all occupations in or associated with retail stores of all kinds. Men in the classes affected may no longer be employed in taverns, liquor, wine, or beer stores, ice cream parlors or soda fountains, barber shops or beauty parlors, gasoline service stations, or as waiters, taxi drivers, elevator operators, bell boys, domestic servants, greens and grounds keepers, busboys, charmen and cleaners, dishwashers, doormen and starters, dancing teachers, custom furriers, private chauffeurs, or porters except on railways. Men in the cleaning, dyeing, and pressing industry, but not laundry work, are included, as are all occupations associated with entertainment, clubs, bowling alleys, poolrooms, baths, guide service, and shoe shining. In addition, industries specifically affected by the order are the manufacturing of feathers, plumes, artificial flowers, chewing gum, wine, lace goods, greeting cards, distilling alcohol for beverages, factory production of statuary and art goods.

Interviews Arranged

While men had to report by June 15, employers with three or more men in the classes called up were asked to contact the local National Selective Service office to arrange for a time for the interviews with these employees. Men living too far from a NSS office could write in and would then be told where to report. Men posted to essential jobs can appeal to a Court of Referees if they object to the work to which they have been posted, but if they refuse to go the jobs after the decision of the Court of Referees they can be sent to compulsory labor service camps set up for conscientious objectors. Permits will be granted to men in the classes called to remain on their jobs for such period as necessary after June 15. This applies to men in small retail business, such as candy and tobacco stores, who may be called up, to allow them to wind up their affairs, or to key men in the non-essential industries named, or to men not needed at once to fill essential jobs. Penalties have been provided for both employers and employees failing to register men in the classes called or for employing men in these occupations after the June 15 deadline without a permit.

First industry to be helped with the new regulation was coal mining, with the Dominion in May declaring a national emergency in coal mining due to labor shortage. All men with coal mining experience had to register, irrespective of registration under the compulsory job transfer. Employers had to report names of men in their employ with coal mining experience. Coal miners were even called from the armed forces in Canada. While awaiting placement at coal mines the government paid these men 40 cents an hour for a 48-hour week.

Men called up under the compulsory job transfer and moved away from home to essential jobs were provided with transportation. They were also assured that they would not be used in industry as strike breakers, or in the words of Labor Minister Humphrey Mitchell "where vacancies arise out of an industrial dis-

Take a Look at TOMORROW—*Today!*

Mr. Now: Dried out, *soaked, and baked,* eh! So that's why Century Motors stand up!
Mr. Postwar: I'll remember that — it's another reason why I shall specify *Century* Motors.

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CENTURY INSULATION
Assures Continuous Motor Performance Under the Toughest Conditions

By the use of slow-moving conveyors and automatically-controlled ovens, the completed stator and winding of Century Motors is dehydrated, and then is submerged in and passes through a tank filled with Century "Clingto" insulating varnish, and then baked. This process is repeated as necessary to preserve and seal the winding into a homogeneous mass.

This is followed by a final coat of Century "Protecto" insulation compound which places a heavy exterior protecting armor over the entire winding.

Century slot insulation is built up with fibre board for mechanical strength and varnished cloth for dielectric strength.

The entire Century insulation process produces a winding that is highly resistant to moisture, to tropical climatic conditions, to mild acid and alkali fumes, and to the effect of magnetic vibration and the mechanical impact of particles carried by the cooling air.

Such insulation material and treatment is absolutely necessary for motor protection for long operating life.

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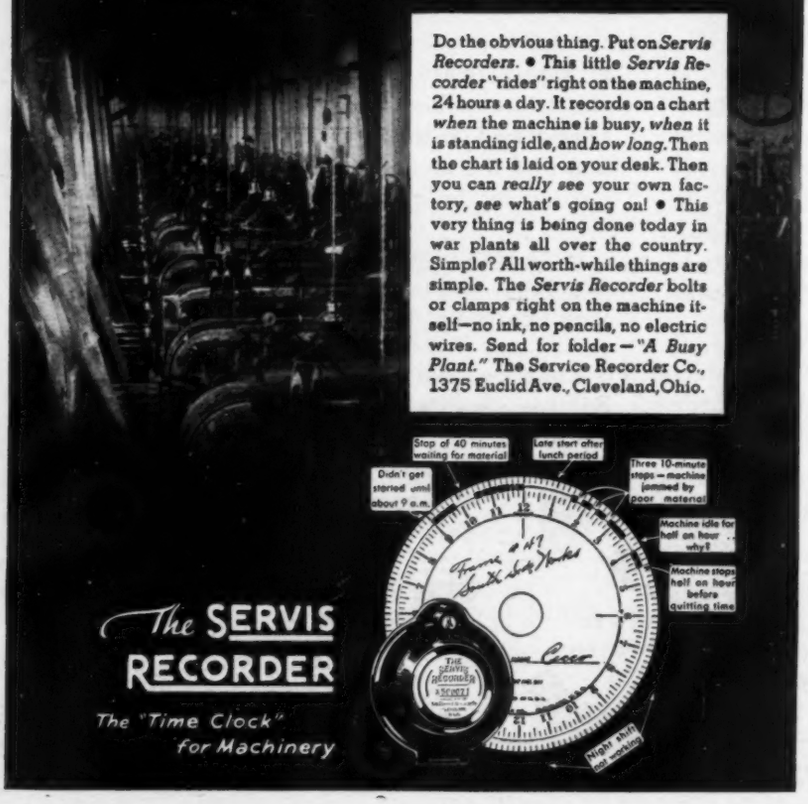
MACHINE HOURS
— how to increase same!


Stop of 40 minutes waiting for material
Late start after lunch period
Didn't get started until about 9 a.m.
Three 10-minute stops — machine jammed by poor material
Machine idle for half an hour . . . why?
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The "Time Clock" for Machinery

pute." Men affected by the job transfer are assured fair minimum earnings for the class of work to which they may be directed.

How many men were affected by the order the government has not yet stated, nor how many will be transferred to war industries. But it is known that war industries and other essential industries with large labor forces are being investigated to find if there is any labor hoarding of men in the affected military call-up classes. While only two compulsory employment transfer orders have been issued to date, others are expected to be issued from time to time, the NSS calling in the less essential occupations and industries first, gradually working up to higher priority industries and occupations. The compulsory employment transfer orders were advertised widely.

•

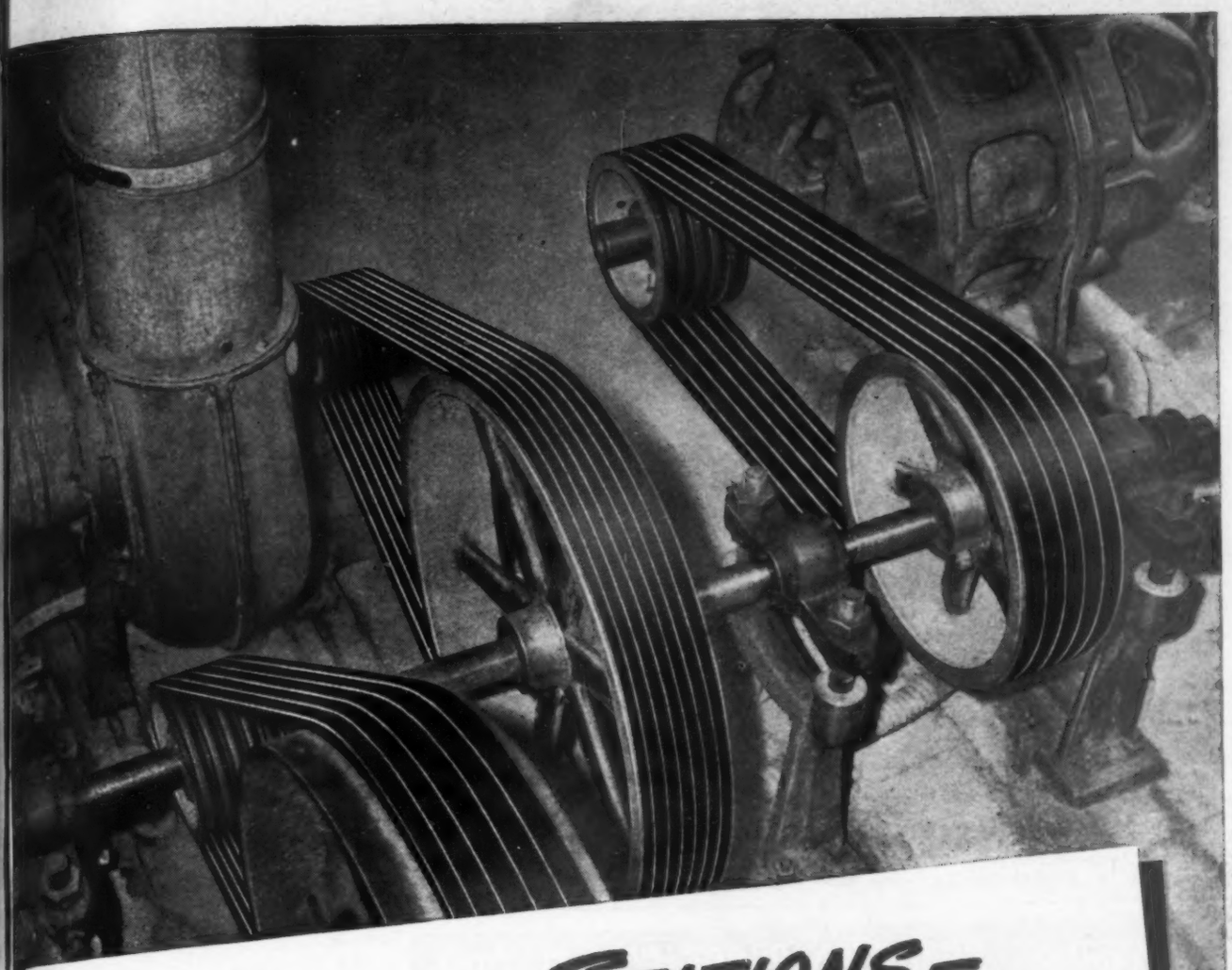
The Training of Women

PAUL BERGEVIN, Director, Department of Trades and Industry, Anderson Public Schools, Anderson, Ind.

WITH a constantly decreasing reservoir of men it has become necessary to focus our attention more seriously toward the training of women for war production. The job of training women is not difficult. Women who have never been in industry before are readily adapted to industrial methods under proper training procedure, and in the majority of cases they do a good job. Various programs have been conducted over the past two years and many of them have been successful. The remarks that follow are intended to crystallize some observations and past experiences on this type of training.

Any training program, regardless of its length, should do more than give the trainee some needed skill in actual machine operation. Training involves the adjustment of mental attitude as well as the acquisition of skill. The problem of orienting women to industry can be effectively solved if the preliminary training has both these factors as objectives. Too frequently we assume too much. A good industrial instructor realizes the mental adjustment necessary for women who have had very little, if any, industrial experience. He saves time by taking time to see that she is properly trained.

Competent work people should be thoroughly acquainted with the tools they use, the ideas of industrial precision and accuracy, safety principles, the need for punctuality and regular attendance, and how to get along with the people with whom they are to work. New workers, as a rule, do not get this picture as readily as the demands of war industry necessitate, unless some careful consideration is given to proper instruction. Unfortunately, too, much current practice reminds one of the woodchopper who is too busy to sharpen his axe. It has been the experience of many individuals that women now being employed are not only deficient in mechanical knowledge, but also the fact that they have never been in industry and have failed to have the advantage of



BATTLE STATIONS—

Machines driven by Dayton V-Belts man the battle stations of the production line. And in over 100,000 war-vital plants tough, durable Daytons stand up under high speeds, peak loads and shock loads despite staggering work schedules, excessive temperature, dust and moisture conditions. Built-to-bend Daytons grip firmly and transmit smooth-flowing power for every kind of job from sun-up to sun-up around the calendar. For American industry at war Daytons are increasing output, cutting power losses, reducing maintenance, protecting machinery and conserving time, money and floor space.

Near you is a Dayton distributor whose stock of V-Belts is supplemented by strategically located factory warehouses. Call on him for service or helpful suggestions regarding the conservation of V-Belts.

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3, 5, 8, 12 and 20-ton capacities, 9" high. All lift over 6" *plus* extension of telescoping screw. 20-ton is 10" high; has no extension screw.

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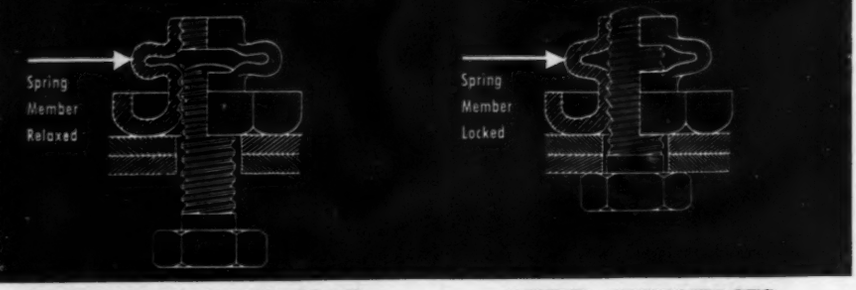

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Upon insertion of bolt, top section of nut is extended to engage with threads of bolt. A constant force is thus established which locks nut firmly into position. Axial thread play is eliminated.

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BOOTS AIRCRAFT NUT CORPORATION
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accumulating necessary industrial knowledge by exposure, has made that adjustment a production and social problem worth considering.

Regardless of how insignificant, as far as difficulty is concerned, a job is, it is worth doing right. Economy of time and materials demands that some thought be given to proper training. One of the significant fallacies in the employment of women in war industries is the current belief that the way to train them is to put them on the job and let them muddle away a few weeks with the already overworked supervisor as the instructor. This is how they did a job years ago. It was the custom to have an apprentice carry around the tools of his master and follow him wherever he went, hoping that he could pick up, in seven years, sufficient information to make him a journeyman. The attitude toward training individuals in specific applications for industrial jobs is sometimes like the old-time apprenticeship. Much of the supervisor's time and the individual's production time, can be saved by placing new workers in a skillfully worked out "pre-induction" program. This program will knock off their rough edges and prepare them for the job. The time of the supervisor will, therefore, be saved for other parts of his job.

The material that follows is gathered through experiences and observations. Some of the facts were taken from the Indiana War Production Training Division of the State Department of Public Instruction, the Training Within Industry group of the War Manpower Commission, and the British Engineering Bulletins. The problem is approached from three angles: (1) The trainee; (2) the instructor; (3) the information offered. Each of these angles will be examined in the light of efficient training of women war workers.

1. The Trainee

(a) Handicaps

I. Women lack basic mechanical knowledge. This fact necessitates a different approach. Nothing can be assumed, particularly in the early stages of training. Detailed and simple instructions are always essential.

II. Women, as a rule, are not familiar with the use of machine or hand tools. This difficulty can be overcome by the proper explanation of the use and care of tools, using as many of the fundamentals of good teaching as apply—i.e., show, tell, let them hold, feel, examine, and use the device under your guidance.

III. Many women have never been in a factory. Unfamiliar surroundings, running machinery, and new personalities are initial disturbing factors. Frequently women fear running machinery. Familiarity with the new surroundings will make them feel at home. Under the guidance of a competent and sympathetic instructor this unsettled mental state can be coped with, and turned to caution rather than fear.

IV. Women's dress is frequently dangerous. Safety rules must specifically out-

TEAMING OF TRUCKS

in many cases is sure way to GREATER SPEED AND LOWER COSTS . .

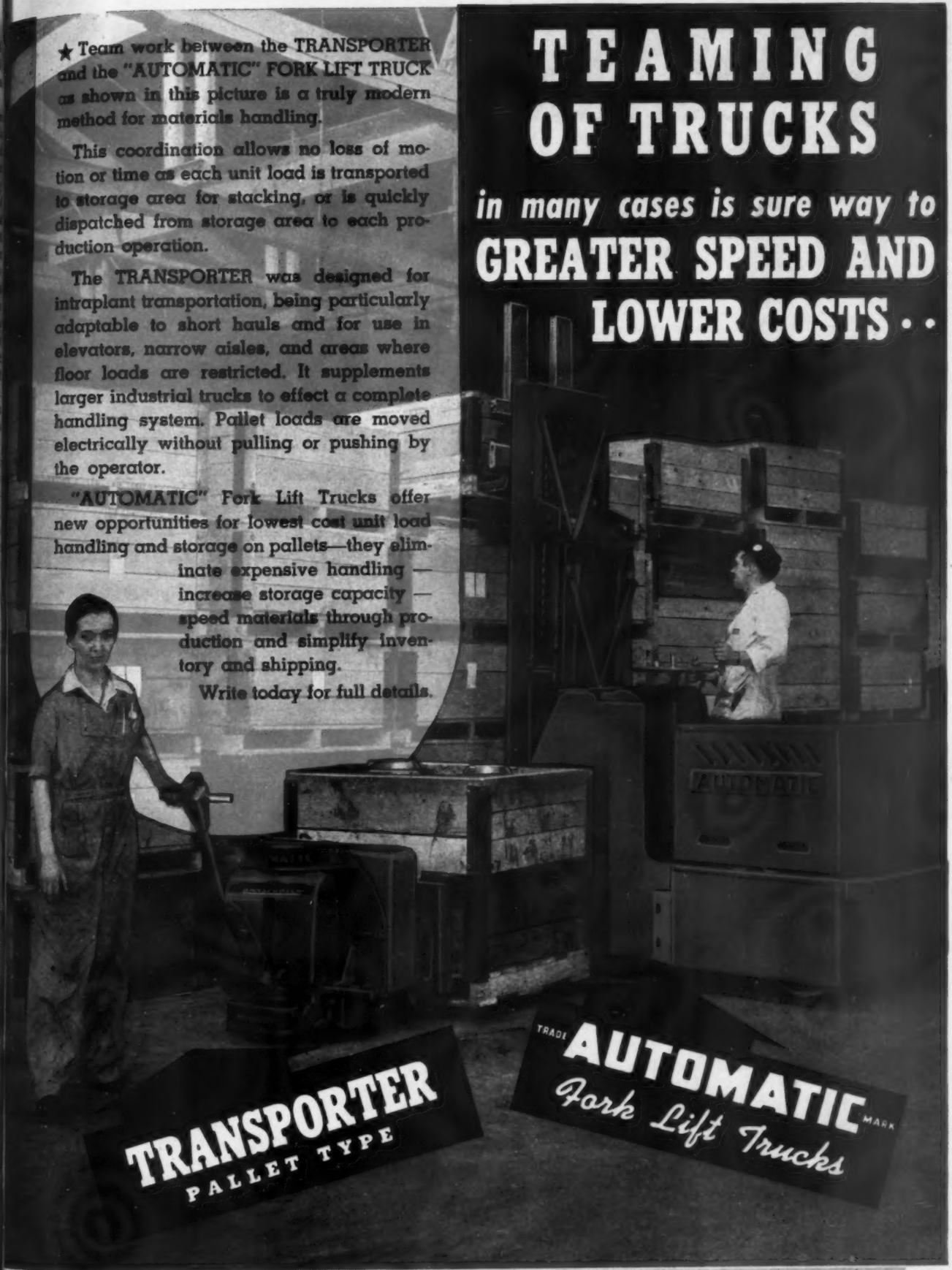
★ Team work between the TRANSPORTER and the "AUTOMATIC" FORK LIFT TRUCK as shown in this picture is a truly modern method for materials handling.

This coordination allows no loss of motion or time as each unit load is transported to storage area for stacking, or is quickly dispatched from storage area to each production operation.

The TRANSPORTER was designed for intraplant transportation, being particularly adaptable to short hauls and for use in elevators, narrow aisles, and areas where floor loads are restricted. It supplements larger industrial trucks to effect a complete handling system. Pallet loads are moved electrically without pulling or pushing by the operator.

"AUTOMATIC" Fork Lift Trucks offer new opportunities for lowest cost unit load handling and storage on pallets—they eliminate expensive handling — increase storage capacity — speed materials through production and simplify inventory and shipping.

Write today for full details.



TRANSPORTER
PALLET TYPE

TRADE **AUTOMATIC** MARK
Fork Lift Trucks

MANUFACTURERS FOR OVER 35 YEARS *Electric Propelled* INDUSTRIAL TRUCKS

AUTOMATIC TRANSPORTATION CO.
DIV. OF THE YALE & TOWNE MFG. CO.
39 WEST 87th STREET CHICAGO, ILLINOIS

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SAFE FOOTING for War Workers
Kerlow Open Steel Flooring is SAFE, because its open-mesh, non-skid design provides slip-proof footing under all conditions . . . allows light to reach dark corners . . . assists ventilation . . . prevents accumulations of oil or small objects . . . provides ample strength . . . resists deterioration.
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FREE BULLETIN
Write for your copy today
KERLOW Open STEEL FLOORING

LIME-SCALE

and rust removal problems solved!

To enable your water-cooled, water-circulating and steam-jacketed equipment to meet today's urgent war demands with maximum efficiency, all insulating lime-scale and rust deposits should be periodically removed. But be sure you do this job QUICKLY and EASILY. How? By using

OAKITE COMPOUND No. 32

As plants the Nation over have discovered, you, too, will find this effective, time-saving material is your best bet for getting rid of lime-scale and rust deposits thoroughly, safely, at low cost. This 24-page manual describes methods for using Oakite Compound No. 32 that conserve manpower, reduce equipment down-time and increase operating efficiency.

FREE Booklet Gives Details!

Your copy of this informative de-scaling and de-rusting manual is FREE! Write today!

OAKITE PRODUCTS, INC., 14A THAMES STREET, NEW YORK, N. Y.
Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE MATERIALS . . METHODS . . SERVICE — Buy Bonds for Victory — CLEANING FOR EVERY CLEANING REQUIREMENT

line the only type of clothing permitted in the shop. All jewelry including rings and earrings, bracelets, necklaces, and wrist watches are to be prohibited. Only flat-heeled shoes should be worn. Insist on hair nets or turbans covering all the hair at all times. Loose clothing should not be permitted. Specify slacks or overalls and shirt sleeves of elbow length.

V. Differences in women trainees as the susceptibility to fatigue, lack of strength of men, tendency to go too often and spend too much time, in the washroom.

If we are to do a job of training that will make women readily acceptable employees we must recognize and overcome, as far as possible, factors that will cause a decrease in their productive contribution to the war.

(b) *Advantages*

I. Accuracy. Women tend to be careful, neat, and accurate.

II. Patience.

III. Speed. When a skill is acquired most women turn in excellent performances.

IV. Sharp interest. In many cases the work is a new experience. Women in this class are eager to succeed.

V. Neatness and cleanliness. Most women are more orderly and cleaner than men. This advantage can be properly directed toward the shop in keeping everything in its proper place.

VI. Response to instruction. Women usually do their best to follow directions carefully as given by the instructor.

2. The Instructor

What he should do

I. Know safety rules and insist that they be carefully studied and followed by the trainee. Hold a session on safety with *each group of trainees*, discussing the need for the cultivation of safe work habits on the part of the trainee.

II. Develop in the trainee a desire to be in, and contribute toward, a clean, orderly shop. This good housekeeping training is as essential as the mechanical training. No training is complete unless the trainee has as much knowledge of how to take care of her tools and equipment and workplace as she has of the use of her tools and equipment.

III. Hold to a carefully worked out course of instruction.

IV. Use proved methods of good instruction: (1) Prepare the trainee; (2) present the problem; (3) let the trainee perform under your guidance; (4) check and follow-up trainee.

V. Develop an attitude of helpful friendliness in the shop. This is not to be interpreted as an easygoing manner, but rather a friendly, cheerful, business-like method of training where correct methods and good jobs are complimented, and poor work is constructively criticized.

VI. Look to physical conditions of the

Diversified Service . . .

A diversified background of experience in building electric plants for all types of applications enabled the U. S. Motors Corporation to step right into war production and meet the diversified requirements of our various branches of war service. This new experience being gained from our extensive war output will further accrue to the advantage of U. S. Electric Plant users after the war in the form of even lower cost electricity and more dependable service.

"U. S." Electric Plants are in active war service on battle fronts throughout the world.

UNITED STATES MOTORS CORP.
OSHKOSH, WISCONSIN

2, 4, and 6 Cylinder Units 5 to 75 KW

U.S. ELECTRIC PLANTS

DIESEL *and* GASOLINE

The story of

THE BOMBER THAT WOULDN'T BURN

Several weeks ago fire prevention officers of a bomber base came to us for help. A demonstration of fire extinguishment methods for aircraft crash fires was to be staged on a full scale model of a B-17 Flying Fortress—wooden framework covered with doped airplane fabric. Their problem was to find some means of retarding the destruction of the bomber by fire sufficiently to permit the demonstration of various extinguishment techniques. 50 gallons of crank case oil were to be smeared on all leading edges, 150 gallons of high octane gasoline were to be placed in wing and fuselage tanks and 180 gallons sprayed over the model before setting it afire.

On our advice the wooden framework of the bomber was protected with 2 coats of Firepel "S".

When the gasoline and oil were ignited, the fire was so intense that the firemen needed the protection of water curtains—yet in 14 minutes the fire was out. The wooden framework of the bomber was still standing, and official motion pictures show the unsuccessful efforts of the fire party to shake the framework down.

TESTED AND APPROVED BY Underwriters' Laboratories Inc. FOR PROTECTION AGAINST FIRE HAZARD

ALBI-firepel "S"

REG. U. S. PAT. OFF.

for full information write

ALBI **Firepel Corporation**

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THE WHEELS of Industry

INDUSTRIAL production depends on the free, easy movement of raw materials and finished products. In many operations, that means wheels—substantial, dependable wheels that really "keep things rolling"—smoothly.

You'll find that there's an EWC Wheel for virtually every Industrial need—either to fit old axles or furnished with new axles and roller bearings. These wheels are properly engineered to speed handling—assure safety—save power.

Write Dept. FA for Literature, Prices and Suggestions

EWC WHEELS

Electric Wheel Co., Quincy, Ill.

workplace. Try to keep the temperature about right. Ventilate if necessary.

VII. It has been proved dangerous to allow trainees to operate machinery when the instructor is not in the shop. Do not permit trainees to operate machinery during rest or lunch periods unless the instructor is present.

VIII. Be friendly, but never familiar with trainees.

IX. Insist that all trainees be present regularly and on time. This training, like that of good housekeeping, is an integral part of the training job. If trainees get the habit of regular attendance and punctuality during training they will carry it over to their war work. Set and accurately maintain the time for any rest periods. Emphasize this.

3. The Information Offered

I. Punctuality and regular attendance are emphasized by example; by starting and stopping the groups as scheduled, and by discussing the problem of irregular attendance or late comers with the individuals concerned as often as necessary during the entire training period.

II. Safety and good housekeeping. This includes a discussion of safety principles and practices between the instructor and the trainees, plus general observations made by the instructor. A careful follow-up during the entire period of training supplements and fortifies the formal group discussion period. During this follow-up the instructor brings out to the individual concerned unsafe practices and careless methods whenever noted.

III. Industrial ethics. Women in larger numbers in industry may create problems which heretofore did not appear significant. During their training period much can be done to familiarize them with good practice regarding their relationship with fellow employees. This instructional unit is conducted during the regular practical operational phase of the entire course. Rather than by formal discussion, it is brought out by example, and by creating a business-like atmosphere in the shop during the period of training. Personal talks with violators is recommended if necessary.

Several points are to be considered by the instructor: (a) Proper use of rest and toilet rooms—care not to leave too often, or be gone too long; proper use of wash bowels, paper towels, etc.; (b) attitude toward men workers—friendly but not familiar; asking no special favors; not trading on sex; (c) individual responsibility for maintaining high morale; danger of gossip.

IV. Technical skill. The proper acquisition of the skill of a particular job will not, in itself, make a good war worker. The appreciation of their responsibilities to other workers and their employer, punctual and regular attendance, a knowledge of good housekeeping and safety, and technical skill will make a woman worker well qualified to do her part in war production plants.

MAKE THIS TEST — *Prove* BRIXMENT is BEST!

1

Take some Brixment mortar and some 50-50 lime and cement mortar. Try shoving a full head-joint with each mortar. You'll find that with the Brixment mortar

2

(1), it is much easier to shove the brick accurately into place, with a full head-joint, than it is to do the same thing with the other mortar (2).

BRIXMENT *Makes a More PLASTIC Mortar!*

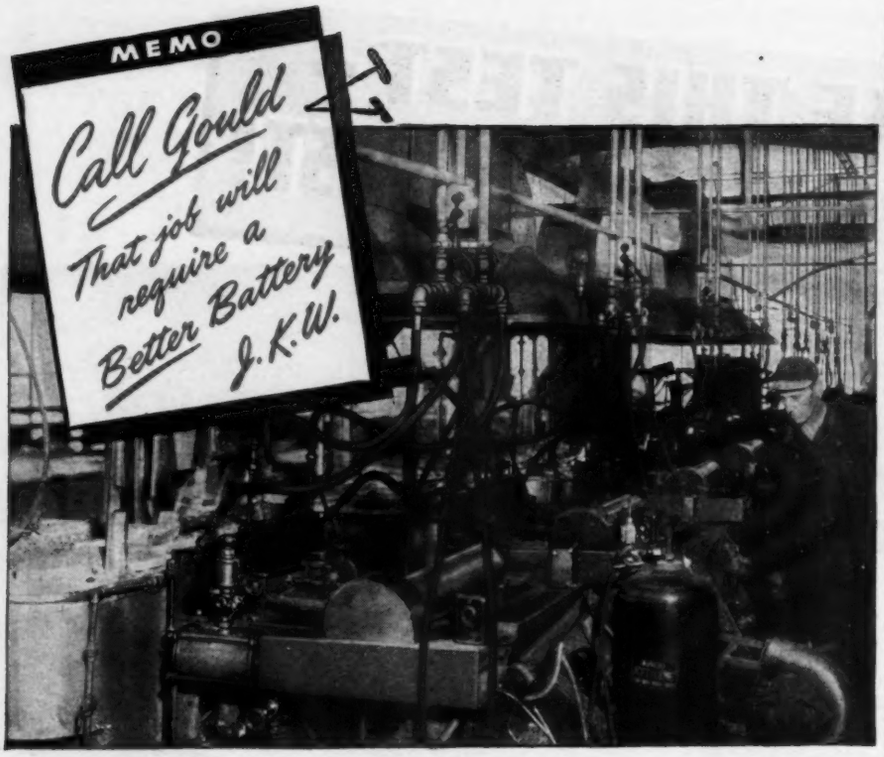
One of the most important characteristics any mortar can possess is *plasticity*. Within certain limits, plasticity is the greatest single factor not only in the *economy* of the brickwork, but also in its strength, its neatness and its resistance to the passage of water.

One of the most outstanding characteristics of Brixment mortar is its unusual plasticity. For nearly twenty-five years, bricklayers all over the United States have agreed that the working qualities of Brixment are comparable to those of straight lime putty. This exceptional plasticity makes it easy for the bricklayer to secure neat, economical brickwork, with the brick properly bedded, and the joints well filled. And because of this unusual plasticity, a bag of Brixment will carry three full cubic feet of sand and still make an ideally workable mortar.

BRIXMENT

For Mortar and Stucco

Louisville Cement Company, Incorporated, Louisville, Kentucky. Cement Manufacturers for Over a Century.

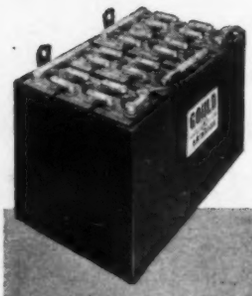


CUSTOM BUILT WITH MASS PRODUCTION ACCURACY

• Most industrial storage batteries are designed and made for a particular job. They are not mass produced in quantity. However, certain mass production techniques worked out by Gould engineers have been applied to many important steps in the manufacture of Gould industrial batteries. These have resulted in greater uniformity of product and a higher standard of quality.

For instance, the Gould grid casting machine pictured here has upped production from approximately 2,000 per day for the hand casting operation to 5,000 per day per machine, and the finished product is better.

When your industrial battery is Gould designed and Gould manufactured, it is a guarantee of longer battery life and more economical operation.



SPECIFY GOULD KATHANODE
The original spun glass battery tested by 20 years of actual service.

Rated Conservatively . . . *Goulds equal or exceed in capacity any battery of comparable size and cell structure.*

GOULD STORAGE BATTERY CORPORATION, DEPEW, NEW YORK

Builders of industrial batteries for every application. Sales and service offices in principal cities of the U.S.A.

Factories at Depew, N. Y., North Bergen, N. J., Dallas, Atlanta, Chicago, St. Paul, Leavenworth, Los Angeles

ARMY E NAVY *FOR EXCELLENCE IN STORAGE BATTERY PRODUCTION AT DEPEW PLANT*

GOULD

Since 1898 THE BATTERY PICKED BY ENGINEERS

DON'T OVERTAX YOUR BATTERY

One of a series of service suggestions for users of industrial batteries.

▶ Your storage battery is made to do a specific job, and its manufacturer rated it accordingly—so many ampere hours at the 8 or 6-hour rate, as the case may be. It is an accepted practice to work a battery to its full capacity. Regular full capacity discharges keep a good battery "awake", and actually stimulate its action so that it performs well for a long trouble-free life.

But here's the "But": Don't overwork any battery consistently. Don't discharge, as a matter of routine, beyond the rated capacity of the battery unit. Goulds can and will give more than rated capacity and will do so continuously for a long period of time. However, when discharges are carried beyond the point of rated capacity, an unusual strain is imposed on grid members, and this strain tends to shorten grid life.

The cause of this strain can be traced to the active material. In the positive plate, lead peroxide (the synthesis of the material when charged) has a smaller volume than the lead sulphate which forms as the battery discharges. From this it can readily be seen that since there is a change in volume, an expanding and contracting action takes place as the battery charges and discharges.

This is the point: Your battery manufacturer allows for this action, basing his design on the capacity of the unit involved. However, discharges beyond the rated point cause a further expansion, and consequently a greater contraction on charge. In an emergency it is permissible to discharge beyond the point of rated capacity, but *only* in an emergency. Continued use of any battery beyond this point amounts to direct abuse and must be avoided.

We would like you to know the Gould men who will take care of your industrial storage battery requirements.

Serving a number of states in the southern Mississippi Valley are W. H. Burkey, Sales and Service Manager, at 1218 Olive Street, St. Louis, Mo., and J. F. Bursh of 1901 So. Fourth Street, Leavenworth, Kansas. Somewhat farther west and south is R. G. Lawrence at 4935 Cass Street, Dallas, Texas.

Gould also has two factories in this same area, one located at Leavenworth, Kansas and the second at Dallas, Texas.

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ALERT management has substantially increased production, with marked savings in power, capital investment and operating cost—by using streamlined, fast Walker-Turner Machine Tools on hundreds of jobs where heavy machine tools were formerly employed.

With these accurate, easily operated Walker-Turner units, unskilled operators quickly reach maximum production. They can be installed anywhere on the production line because of the compactness that advanced engineering and discriminating selection of materials permit. For full information, send for our new catalog.

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WALKER-TURNER RADIAL DRILL

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DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

FOR EASY
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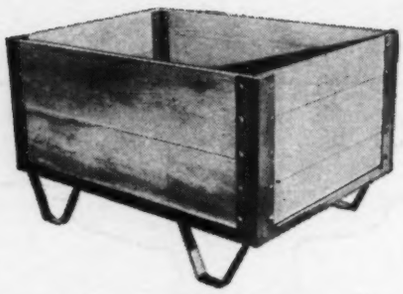
"MAN-HANDLING"

SKIDS, PLATFORMS & TRUCKS
FOR EVERY REQUIREMENT



A typical "Ironbound" skid box superstructure. Flexibility of design permits the tiering of additional units to any height.

A completely assembled "Ironbound" skid with flush angles and countersunk bolts. Will handle loads up to 20,000 pounds.

★The safety-design features built into every "Ironbound" unit are your guarantee of maximum man-hours on the job, with minimum accidents to operators. Check the complete line of "Ironbound" standard types now available. If you have a special problem, your individual design will be produced on short notice. Write for illustrated literature. Your inquiries are wanted.

IRONBOUND BOX & LUMBER CO.
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IRONBOUND
SKIDS
AND MATERIALS-HANDLING EQUIPMENT

War Labor Disputes Act

Following is text of anti-strike bill as passed by Congress June 25 over the President's veto

An act relating to the use and operation by the United States of certain plants, mines and facilities in the prosecution of the war, and preventing strikes, lockouts and stoppages of production, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled:

Section 1. This act may be cited as the "War Labor Disputes Act."

Definitions

Sec. 2. As used in this Act—

(a) The term "person" means an individual, partnership, association, corporation, business trust, or any organized group of persons.

(b) The term "war contract" means—

(1) a contract with the United States entered into on behalf of the United States by an officer or employee of the Department of War, the Department of the Navy or the United States Maritime Commission;

(2) a contract with the United States entered into by the United States pursuant to an Act entitled "An Act to promote the defense of the United States";

(3) a contract, whether or not with the United States, for the production, manufacture, construction, reconstruction, installation, maintenance, storage, repair, mining or transportation of—

(A) any weapon munition, aircraft, vessel or boat;

(B) any building, structure or facility;

(C) any machinery, tool, material, supply article or commodity; or

(D) any component material or part of or equipment for any article described in subparagraph (A), (B) or (C);

the production, manufacture, construction, reconstruction, installation, maintenance, storage, repair, mining or transportation of which by the contractor in question is found by the President as being contracted for in the prosecution of the war.

(c) The term "war contractor" means the person producing, manufacturing, constructing, reconstructing, installing, maintaining, storing, repairing, mining or transporting under a war contract or a person whose plant is equipped for the manufacture, production or mining of any articles or materials which may be required in the prosecution of the war or which may be useful in connection therewith; but such term shall not include a carrier, as defined in title I of the Railway Labor Act, or a carrier by air subject to title II of such Act.

(d) The terms "employer," "employee," "representative," "labor organization" and "labor dispute" shall have the same meaning as in section 2 of the National Labor Relations Act.

Power of President to Take Possession of Plants

Sec. 3. Section 9 of the Selective Training and Service Act of 1940 is hereby amended by adding at the end thereof the following new paragraph:

"The power of the President under the foregoing provisions of this section to take immediate possession of any plant upon a failure to comply with any such provisions, and the authority granted by this section for the use and operation by the United States or in its interests of any plant of which possession is so taken, shall also apply as hereinafter provided to any plant, mine, or facility equipped for the manufacture, production, or mining of any articles or materials which may be required for the war effort or which may be useful in connection therewith. Such power and authority may be exercised by the President through such department or agency of the government as he may designate, and may be exercised with respect to any such plant, mine, or facility whenever the President finds, after investigation, and proclaims that there is an interruption of the operation of such plant, mine, or facility as a result of a strike or other labor disturbance, that the war effort will be unduly impeded or delayed by such interruption, and that the exercise of such power and authority is necessary to insure the operation of such plant, mine, or facility in the interest of the war effort:

Provided, That whenever any such plant, mine, or facility has been or is hereafter so taken by reason of a strike, lockout, threatened strike, threatened lockout, work stoppage, or other cause, such plant, mine, or facility shall be returned to the owners thereof as soon as practicable, but in no event more than sixty days after the restoration of the productive efficiency thereof prevailing prior to the taking of possession thereof:

Provided further, That possession of any plant, mine, or facility shall not be taken under authority of this section after the termination of hostilities in the present war, as proclaimed by the President, or after the termination of the War Labor Disputes Act; and the authority to operate any such plant, mine, or facility under the provisions of this section shall terminate at the end of six months after the termination of such hostilities as so proclaimed."

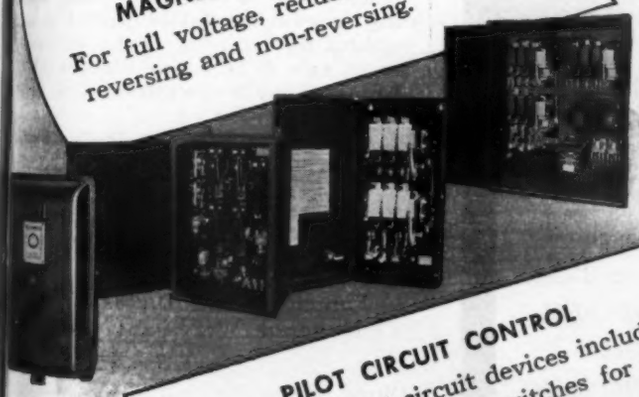
Terms of Employment at Government-Operated Plants

Sec. 4. Except as provided in Section 5 hereof, in any case in which possession of any plant, mine, or facility has been or shall be hereafter taken under the authority granted by Section 9 of the Selective Training and Service Act of 1940, as amended, such plant, mine, or facility,

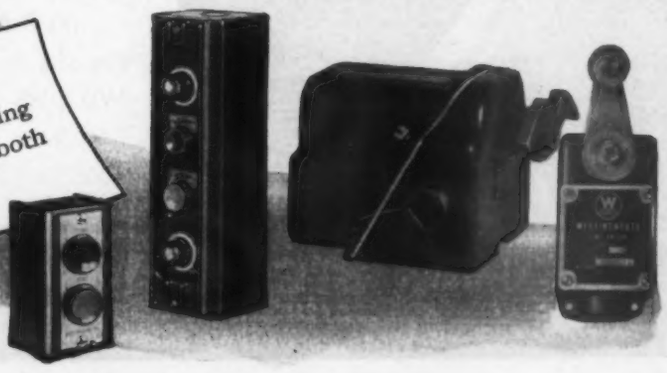
and Motor Control shall be designed to:
1. PROVIDE THE GREATEST RELIABILITY FOR TODAY'S HIGH SPEED WAR PRODUCTION...
that's Westinghouse

MANUAL MOTOR CONTROL
For full voltage, reduced voltage, or step starting, speed regulating, reversing and non-reversing.

MAGNETIC MOTOR STARTERS
For full voltage, reduced voltage, step, reversing and non-reversing.



PILOT CIRCUIT CONTROL
All types of Pilot circuit devices including push buttons and limit switches for both standard and heavy-duty service.



Design features like the Westinghouse "De-ion" principle of arc extinction are certainly a common-sense "must". And today's production goals need the kind of protection that the Bi-metal overload relay can give. The Westinghouse line of a-c and d-c motor controls is complete for motor types that meet requirements of a wide variety of applications.

So when you need motor controls — write "Westinghouse" in the specifications. Then get your Westinghouse representative on the phone. He'll help you all the way from application to installation. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

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Save Time, Labor and Money

Casters in Industry are vitally important and play no small part in the job of "keeping things moving." Hamilton Casters have a third of a century experience behind them—they perform well and last long—conserve time and labor—speed up the war effort. There is a Hamilton Caster for every Industrial Need. Send for complete catalog.

The Hamilton Caster & Mfg. Co.
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Made Right and Priced Right

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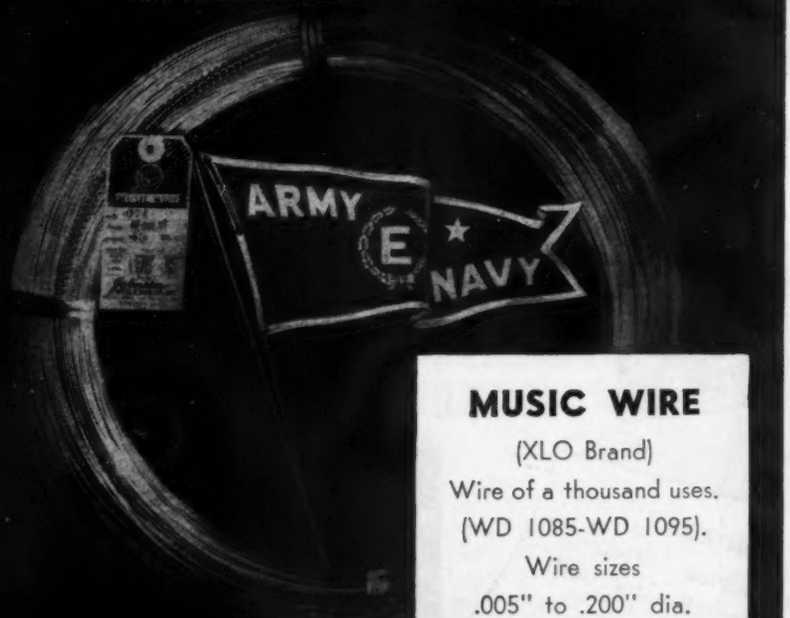
Music Wire



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(XLO Brand)
Wire of a thousand uses.
(WD 1085-WD 1095).
Wire sizes
.005" to .200" dia.

JOHNSON STEEL & WIRE CO., INC.
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NEW YORK ATLANTA AKRON CHICAGO LOS ANGELES

while so possessed, shall be operated under the terms and conditions of employment which were in effect at the time possession of such plant, mine, or facility was so taken.

Application to War Labor Board for Change in Terms of Employment at Government-Operated Plants

Sec. 5. When possession of any plant, mine, or facility has been or shall be hereafter taken under authority of section 9 of the Selective Training and Service Act of 1940, as amended, the Government agency operating such plant, mine, or facility, or a majority of the employes of such plant, mine, or facility or their representatives, may apply to the National War Labor Board for a change in wages or other terms or conditions of employment in such plant, mine, or facility. Upon receipt of any such application, and after such hearings and investigations as it deems necessary, such Board may order any changes in such wages, or other terms and conditions, which it deems to be fair and reasonable and not in conflict with any Act of Congress or any Executive order issued thereunder. Any such order of the Board shall, upon approval by the President, be complied with by the Government agency operating such plant, mine, or facility.

Interference With Government Operation of Plants

Sec. 6 (a) Whenever any plant, mine, or facility is in the possession of the United States, it shall be unlawful for any person (1) to coerce, instigate, induce, conspire with, or encourage any person, to interfere, by lockout, strike, slowdown, or other interruption, with the operation of such plant, mine, or facility, or (2) to aid any such lockout, strike, slowdown, or other interruption interfering with the operation of such plant, mine, or facility by giving direction or guidance in the conduct of such interruption, or by providing funds for the conduct or direction thereof or for the payment of strike, unemployment, or other benefits to those participating therein. No individual shall be deemed to have violated the provisions of this section by reason only of his having ceased work or having refused to continue to work or to accept employment.

(b) Any person who willfully violates any provision of this section shall be subject to a fine of not more than $5000, or to imprisonment for not more than one year, or both.

Functions and Duties of the National War Labor Board

Sec. 7. (a) The National War Labor Board (hereinafter in this section called the "Board"), established by Executive Order Numbered 9017, dated January 12, 1942, in addition to all powers conferred on it by section 1 (a) of the Emergency Price Control Act of 1942, and by any Executive order or regulation issued under the provisions of the Act of October 2,

A Complete Flop!

Today, production in American Industry can't bog down. Things must keep on the move and they do with the finest *Modern Materials Handling Equipment* the world knows—moving, lifting and stacking all Industry's products.

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Our trained industrial engineers, located in all metropolitan centers, are available without obligation to give you the benefit of their experience.

The Yale and Towne Mfg. Company
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YALE

MATERIALS HANDLING EQUIPMENT
HOISTS—HAND AND ELECTRIC • TRUCKS—HAND LIFT AND ELECTRIC
INDUSTRIAL AND RELATED PRODUCTS

UP PERISCOPE!...
and Silent Hoist Winches Raise the Periscope! . . .
Acceptance and use of this equipment by the Navy is a tribute to its quality and efficiency. We are also proud of the extensive use being made of the Krane Kar to help build the Submarine Fleet.
"Silent Hoist" equipment is in service on Battleships, Cruisers, Destroyers, Minelayers, Subchasers, and Submarines . . . and to service these vessels on Shore and Floating Drydocks.
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ARMY E NAVY

2½, 5, AND 10 TON CAPACITIES

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SILENT HOIST WINCH & CRANE CO., 855 63RD ST., BROOKLYN, N.Y.

Basket Troubles

"Buffalo Wire" BUILDS ALL TYPES FOR EVERY USE

Broad facilities at "Buffalo Wire" accommodate any metal basket specifications.

Your design can be fabricated in any wire, mesh or other material; in countless forms, weights and degrees of strength; and in a wide range of metals to withstand specified conditions such as high temperatures, hot acids, rust and corrosion.

FREE ON REQUEST

Basket Folder 595-BB

22 types of baskets illustrated. Information on shapes, accessories, materials. Valuable data on resisting metals for specific conditions.

DOING BUSINESS FROM COAST TO COAST FOR 74 YEARS

Buffalo WIRE WORKS CO., INC.

ESTABLISHED 1869 AS SCHEELER'S SONS

440 TERRACE BUFFALO, N.Y.

1942, entitled "An Act to amend the Emergency Price Control Act of 1942, to aid in preventing inflation, and for other purposes," and by any other statute, shall have the following powers and duties:

(1) Whenever the United States Conciliation Service (hereinafter called the "Conciliation Service") certifies that a labor dispute exists which may lead to substantial interference with the war effort, and cannot be settled by collective bargaining or conciliation, to summon both parties to such dispute before it and conduct a public hearing on the merits of the dispute. If in the opinion of the Board a labor dispute has become so serious that it may lead to substantial interference with the war effort, the Board may take such action on its own motion. At such hearing both parties shall be given full notice and opportunity to be heard, but the failure of either party to appear shall not deprive the Board of jurisdiction to proceed to a hearing and order.

(2) To decide the dispute and provide by order the wages and hours and all other terms and conditions (customarily included in collective-bargaining agreements) governing the relations between the parties, which shall be in effect until further order of the Board. In making any such decision the Board shall conform to the provisions of the Fair Labor Standards Act of 1938, as amended; the National Labor Relations Act; the Emergency Price Control Act of 1942, as amended; and the Act of Oct. 2, 1942, as amended, and all other applicable provisions of law; and where no other law is applicable the order of the Board shall provide for terms and conditions to govern relations between the parties which shall be fair and equitable to employer and employee under all the circumstances of the case.

(3) To require the attendance of witnesses and the production of such papers, documents, and records as may be material to its investigation of facts in any labor dispute, and to issue subpenas requiring such attendance or production.

(4) To apply to any Federal district court for an order requiring any person within it jurisdiction to obey a subpena issued by the Board; and jurisdiction is hereby conferred on any such court to issue such an order.

(b) The Board, by its Chairman, shall have power to issue subpenas requiring the attendance and testimony of witnesses, and the production of any books, papers, records, or other documents, material to any inquiry or hearing before the Board or any designated member or agent thereof. Such subpenas shall be enforceable in the same manner, and subject to the same penalties, as subpenas issued by the President under title III of the Second War Powers Act, approved March 27, 1942.

(c) No member of the Board shall be permitted to participate in any decision in which such member has a direct interest as an officer, employee or representative of either party to the dispute.

(d) Subsections (a) (1) and (2) shall not apply with respect to any plant, mine

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3 It has been proved Marvel Discs will give longer service than a glue bonded disc.

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FAST CUTTING
LONG LASTING
COOL RUNNING
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A FEW TERRITORIES STILL OPEN FOR REPRESENTATION BY AGGRESSIVE AGENTS

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A LIGHT-REFLECTING FLOOR IS THE ANSWER.

Light-colored floors made with Atlas *White* portland cement, instead of gray portland cement or still darker materials, reflect more light on vertical work surfaces as well as on under surfaces. They improve seeing . . . speed production . . . reduce accidents. Installations for Boeing, Consolidated, Douglas, North American, and others prove this.

Light measurements made by General Electric in the Consolidated Aircraft Plant at Fort Worth show that a *white*-cement floor, compared with a gray-cement floor in the same plant—

- ▶ increases illumination on vertical surfaces by 20%;
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- ▶ reduces shadows and dark areas;
- ▶ reduces contrasts . . makes seeing easier, more comfortable, and more efficient.

Floors made with Atlas *White* portland cement help provide all the work-speeding advantages of better illumination. For the complete story, write today for your copy of the 24-page booklet, "Light from Floors." Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

HOW ABOUT MAINTENANCE?

Experience shows white-cement floors are easy to clean, easy to keep clean, and retain their reflection advantage. Maintenance is simple—frequent sweeping, occasional damp mopping, periodic scrubbing.

F-F-19

ATLAS WHITE CEMENT

For Light-Reflecting Floors

or facility of which possession has been taken by the United States.

(e) The Board shall not have any powers under this section with respect to any matter within the purview of the Railway Labor Act, as amended.

Notice of Threatened Interruptions in War Production, etc.

Sec. 8. (a) In order that the President may be apprised of labor disputes which threaten seriously to interrupt war production, and in order that employees may have an opportunity to express themselves, free from restraint or coercion, as to whether they will permit such interruptions in wartime—

(1) The representative of the employees of such war contractor shall give to the Secretary of Labor, the National War Labor Board and the National Labor Relations Board, notice of any such labor dispute involving such contractor and employees, together with a statement of the issues giving rise thereto.

(2) For not less than thirty days after any notice under paragraph (1) is given, the contractor and his employees shall continue production under all the conditions which prevailed when such dispute arose, except as they may be modified by mutual agreement or by decision of the National War Labor Board.

(3) On the thirtieth day after notice under paragraph (1) is given by the representative of the employees, unless such dispute has been settled, the National Labor Relations Board shall forthwith take a secret ballot of the employees in the plant, plants, mine, mines, facility, facilities, bargaining unit or bargaining units as the case may be, with respect to which the dispute is applicable on the question whether they will permit any such interruption of war production. The National Labor Relations Board shall include on the ballot a concise statement of the major issues involved in the dispute and of the efforts being made and the facilities being utilized for the settlement of such dispute. The National Labor Relations Board shall by order forthwith certify the results of such balloting, and such results shall be open to public inspection. The National Labor Relations Board may provide for preparing such ballot and distributing it to the employees at any time after such notice has been given.

(b) Subsection (a) shall not apply with respect to any mine, plant, or facility of which possession has been taken by the United States.

(c) Any person who is under a duty to perform any act required under subsection (a) and who willfully fails or refuses to perform such act shall be liable for damages resulting from such failure or refusal to any person injured thereby and to the United States if so injured. The district courts of the United States shall have jurisdiction to hear and determine any proceedings instituted pursuant to this subsection in the same manner and to the same extent as in the case of proceedings instituted under Section 24 (14) of the Judicial Code.

(Continued on page 292)

JONES CONTINUOUS INDICATING TACHOMETERS

Speed Production

Reduce your overhead by maintaining efficient speeds. Jones Tachometers provide constant check on R.P.M., miles, feet, yards, gallons per minute, etc., total run as well as speed. Innumerable industrial applications — both fixed and portable types available.

- Centrifugal type (no magnets) with uniform scale over entire dial
- Lightweight, durable; ball-bearing mechanism requires no servicing
- Low initial cost
- Rigid inspection and calibration

Our engineering staff will convert any model to meet your special requirements. Write for catalog.

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DAYTON SAFETY LADDERS

have every advantage

No extra man needed to steady—Roomy platform for men and tools—Great strength, lightweight. Guard rails on platform—Automatic locking—Folds compactly. Airplane spruce used throughout—Steel braces—Safety shoes. Available in sizes 3' to 16' in height—Elevating platform adds height to the Dayton Safety Ladder. Write today for Free Catalog—Prices.

DAYTON SAFETY LADDER CO.

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NEVER BEFORE IN ANY WAR...

THE MODERN *BOMBER*

nor the modern

Preformed wire rope

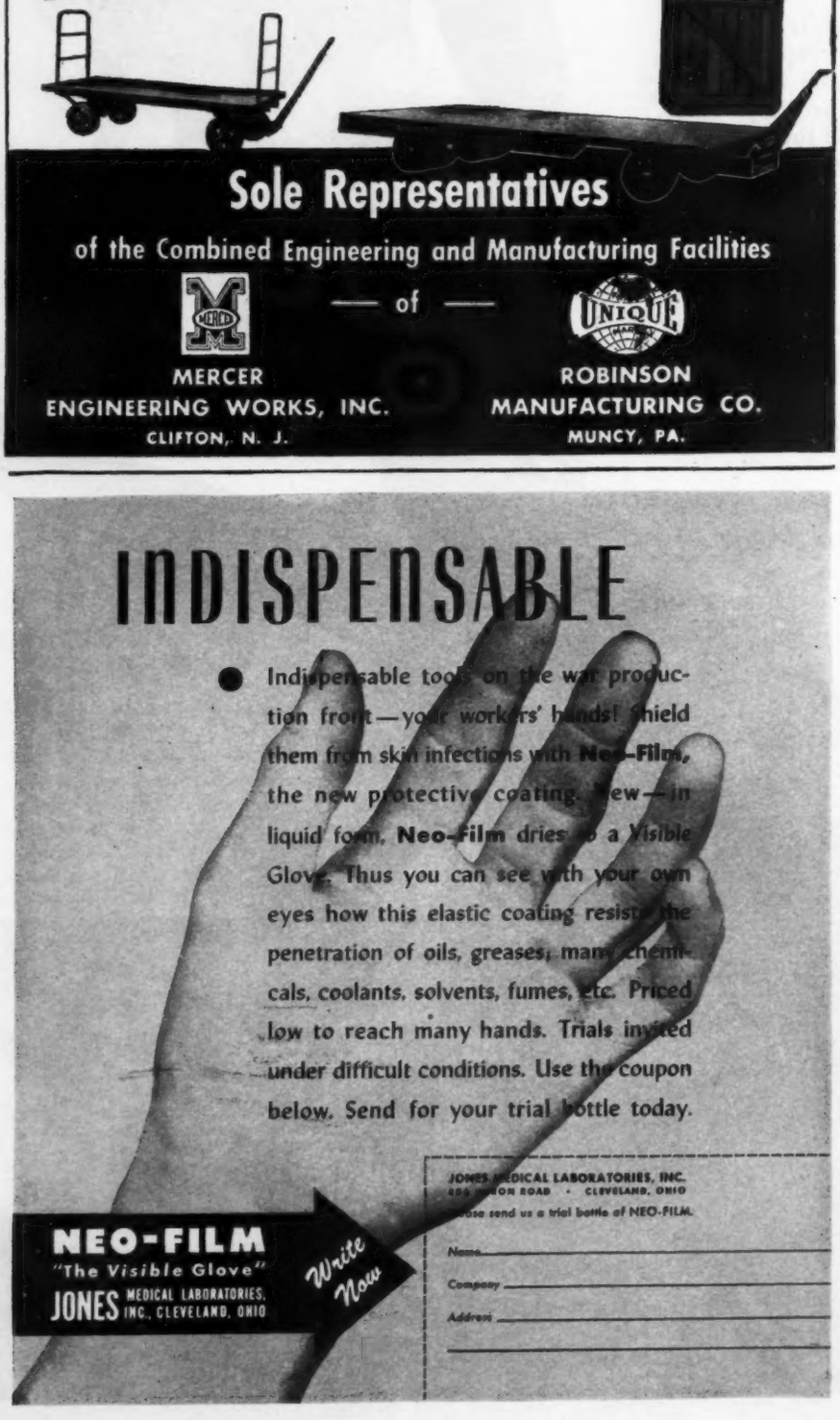
THAT HELPS IT PERFORM

Yes, this is a new and different war. It's a long stride from the frail crates which crept across the troubled skies of 1918 to the modern bombers—today's fabulous flying artillery.

New, also, are the steel sinews of these great planes, made for the first time of Preformed Wire Rope. They convert split-second human reflexes into annihilating action. They race the decisions of alert, fighting brains to rudder, ailerons and elevators; to engines and guns; to turrets and bomb releases.

Preformed's peacetime record won this coveted war assignment. For nearly 20 years Preformed has protected and multiplied manpower. It has reduced delays from accidents and change-overs. It has cut costs. Total this—it means top-speed production, which today is imperative.

Ask your own wire rope manufacturer or supplier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● Indispensable tools on the war production front—your workers' hands! Shield them from skin infections with Neo-Film, the new protective coating. New—in liquid form, Neo-Film dries to a Visible Glove. Thus you can see with your own eyes how this elastic coating resists the penetration of oils, greases, many chemicals, coolants, solvents, fumes, etc. Priced low to reach many hands. Trials invited under difficult conditions. Use the coupon below. Send for your trial bottle today.
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Write Now
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Please send us a trial bottle of NEO-FILM.
Name
Company
Address

(Continued from page 290)

Political Contributions by Labor Organizations

Sec. 9. Section 313 of the Federal Corrupt Practices Act, 1925 (U. S. C., 1940 edition, title 2, sec. 251), is amended to read as follows:

"Sec. 313. It is unlawful for any national bank, or any corporation organized by authority of any law of Congress, to make a contribution in connection with any election to any political office, or for any corporation whatever, or any labor organization to make a contribution in connection with any election at which President and Vice Presidential electors or a Senator or Representative in, or a delegate or resident Commissioner to Congress are to be voted for, or for any candidate, political committee, or other person to accept or receive any contribution prohibited by this section. Every corporation or labor organization which makes any contribution in violation of this section shall be fined not more than $5000; and every officer or director of any corporation, or officer of any labor organization, who consents to any contribution by the corporation or labor organization, as the case may be, in violation of this section shall be fined not more than $1000 or imprisoned for not more than one year, or both. For the purposes of this section 'labor organization' shall have the same meaning as under the National Labor Relations Act."

Termination of Act

Sec. 10. Except as to offenses committed prior to such date, the provisions of this Act and the amendments made by this Act shall cease to be effective at the end of six months following the termination of hostilities in the present war, as proclaimed by the President, or upon the date (prior to the date of such proclamation) of the passage of a concurrent resolution of the two Houses of Congress stating that such provisions and amendments shall cease to be effective.

Separability

Sec. 11. If any provision of this Act or of any amendment made by this Act, or the application of such provision to any person or circumstance, is held invalid, the remainder of the act and of such amendments, and the application of such provision to other persons or circumstances, shall not be affected thereby.

●

Benefits That Follow the Hiring of Women

RAY SANDERS, General Manager, Turco Products, Inc.

THE PECULIAR ADVANTAGES of women in industry too often are overlooked, while the industrialist complains of the headaches they cause. True, personnel and medical departments, teaching and trainee

3 OF A KIND—BUT DIFFERENT!

¶ It takes three kinds of Engineers — all different — to produce "3C" Engineered Electrical Control.

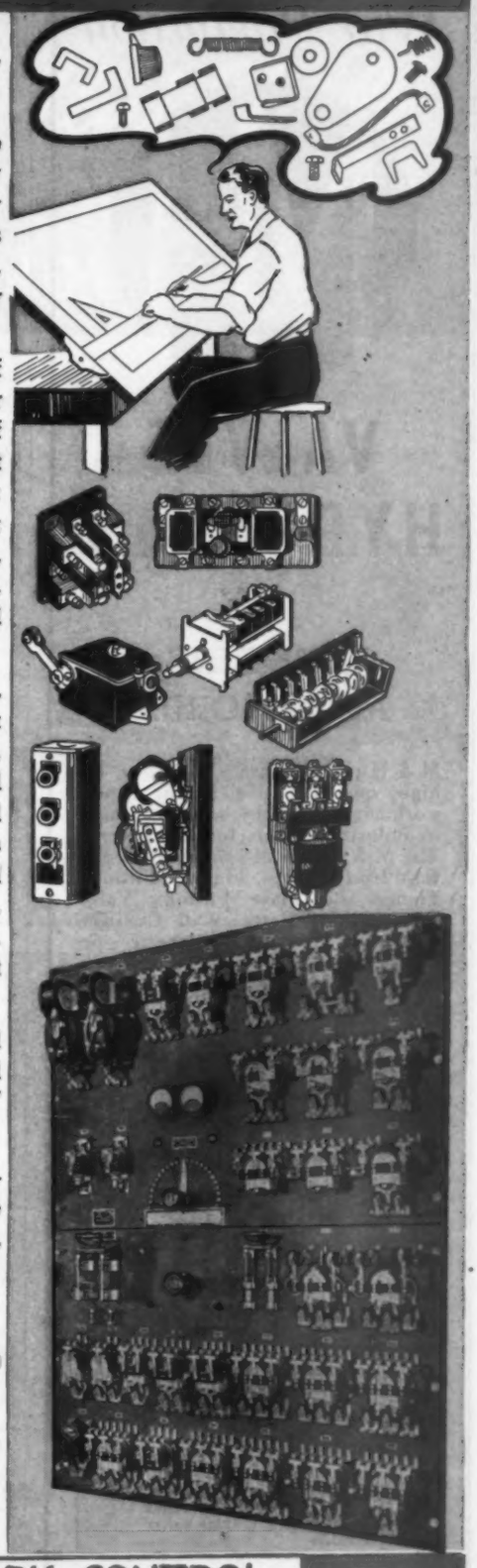
¶ First, the Development Engineer. His problem is developing a definite piece of apparatus to do a definite job. Maybe he works out an entirely new principle of operation; or improves upon a standard design. Many of his ideas are not commercially feasible, but eventually he develops devices mechanically and electrically right, of simple construction, occupying minimum space, with wearing parts and terminals easily accessible, and plenty of wiring space.

¶ Second, the Application Engineer. To him come the problems of recommending the right control for multi-motored machines, for continuous processing lines in mills, or for any of thousands of applications of electrical energy to modern industry. He knows what every piece of "3C" control apparatus will do under given conditions; he understands how to control and protect every type of electric motor; he studies the conditions such as moisture, heat, dust, fumes, gas, corrosion, and the duty cycle under which the control must function, and selects the "3C" apparatus best fitted to provide economical and reliable service to the user.

¶ Third, the Design Engineer. His job is designing the finished panel. From the designated "3C" apparatus needed to control and protect a multi-motored operation, he arranges the various devices in a compact, efficient, workable layout, to provide simple effective wiring, with all parts easily accessible for maintenance. Perhaps the space for control is limited, and he has to use great ingenuity in arrangement of devices to fit the completed panel into the space. From his drawings actual construction starts. Panels are drilled; special devices are made, standard apparatus taken from stock; all parts assembled and wired. His careful work is reflected in low production costs, and in efficient operation of the entire panel assembly for the customer.

¶ Of course there are dozens of other engineers—testing materials and apparatus, checking wiring and operation, doing many odd jobs all tending to produce efficient, trouble proof, low maintenance "3C" control apparatus.

¶ They all work together to produce "3C" Engineered Control—engineered to fit your problems, and to operate efficiently under the conditions in your plant. "3C" Engineered Control is carefully planned, designed and built for the best economical, reliable operation, for we have all three types of Engineers.



CLARK ENGINEERED MOTOR CONTROL

is just another way of saying

"CORRECTLY ENGINEERED MOTOR CONTROL"

—a "3C" service available to you

CONTINUE TO ROLL WITH CLARK CONTROL

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

To Help Maintain War Production

VALVES HYDRANTS

and

PIPE LINE ACCESSORIES

M & H products are well known for high quality material and expert workmanship. They have been used in industrial plants for many years. The M & H line also includes B & S Cast Iron Fittings, Flanged Fittings, Flange and Flare Fittings, Valve Boxes, Shear Gates, Wall Castings, Cutting-in Tees and similar accessories.

CHECK VALVE

M & H Valves are used in industrial plants for water, gas, steam, oil, chemicals and are furnished in all commercial sizes from 2" to 30", inclusive. They are cast iron body, bronze mounted, furnished double disc parallel seat or solid wedge. They are heavily proportioned and have a high factor of safety.

OTHER M & H PRODUCTS

Fire Hydrants	Floor Stands
Gate Valves	Extension Stems
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Check Valves	

Write for Catalog 34

M&H VALVE AND FITTINGS COMPANY

ANNISTON, ALABAMA

staffs have had to be enlarged to what seems a disproportionate extent. However, there are certain real advantages that the average woman worker has over the average male worker. These advantages the industrialist can use to improve plant efficiency. Many times he can turn even the seemingly disadvantageous elements that accompany wholesale female employment into improvement of a whole system.

One distinct advantage that we, as manufacturers of highly specialized chemical compounds, have noted is that women are quicker than men to follow exact, detailed instructions. This is of vital importance when it is realized that the whole character of a chemical compound can be changed by the addition of too much or too little water or solvent. Methods for processing metals are worked out in our laboratories by chemists and process engineers working with our field men and the company's engineers. Once a satisfactory procedure has been developed, it is important that directions be followed closely.

No Bad Work Habits

Most women have no bad habits to unlearn for the simple reason that 99 percent of them have never before even been inside an industrial plant. There is no "old method," no "way I used to do it at the other plant," with women workers. Leadmen used to say: "For the best factory workers, bring us boys from the small farms." They wanted men who had never operated any kind of machine before so they could be taught the right way first. These leadmen have their answer now in women workers.

Out to Do Her Best

Women enjoy learning about new work. Remember that the woman in overalls is as "thrilled" over the heretofore purely masculine world of machinery as she is by her new denim uniform and her company badge. She is out to do her best on the job they said could "never be filled by a woman." She wants to tell her family or boy-friend after the day's work is over that she bucked so many rivets today or how her particular job was okayed by the inspector.

While women have proved excellent routine workers, they also show an intelligent interest in their jobs. The foreman who will take the trouble to sketch in the background of the job at hand—to show just where the particular piece of work fits into final assembly, for example—will obtain results in the redoubled efforts of his feminine employees. Women are realists as well as idealists, and, when they can be shown exactly how their job helps the whole gigantic war effort, they work twice as hard.

They Follow Orders Well

An example of how women workers follow orders better than men is seen in the use of chemical compounds for metal processing. A compound that will clean and deoxidize magnesium perfectly when used in correct proportions, may attack or actually destroy the metal when too much water or solvent is added. Women em-

IMMEDIATE SHIPMENT

on this sturdy, 100% accurate

COUNTER

Model AR

for punch presses and screw machines

—conveyor or production lines
—can making machinery
—case sealing machines
—pumps

and other types of equipment

Write for full details

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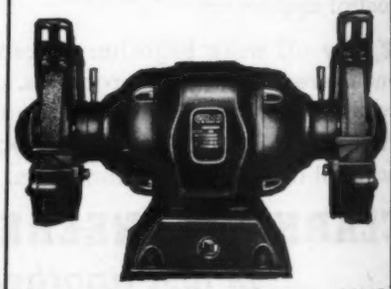
BALDOR
BALL BEARING GRINDERS

Built For Heavy Production Service



One of a COMPLETE LINE

BALDOR Grinder No. 800

½ H.P. Ball-bearing motor. Capacitor type. 1700 rpm., 110 volt, 1-ph., 60 cy. 8" x 1" Aloxite wheels. Enclosed guards, adjustable tool-rests..... **$54.00**

ASK FOR BULLETIN 307

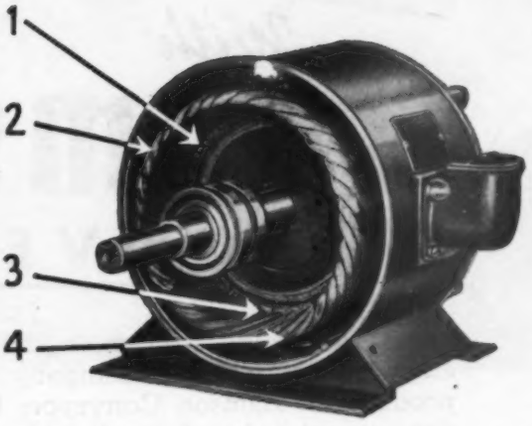
BALDOR ELECTRIC COMPANY
4370 Duncan Ave., St. Louis, Mo.

Manufacturers of
Electric Motors
Electric Motor Grinders
Battery Chargers
Fast Battery Chargers
Battery Testers
Write for Bulletins

NEW INSULATION DEVELOPMENTS GIVE *Longer Life...*

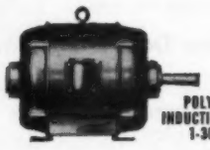
R&M Uni-Shell INTEGRAL HORSEPOWER MOTORS

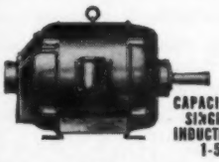
*I*mportant improvements in insulating technique, plus heat-testing of each design with thermocouples imbedded in the windings, insure cool operation with sharply increased life expectancy for every R & M Uni-Shell Motor. Four features of this insulation are indicated in the accompanying illustration. 1. Two layers of the highest-grade impregnated rag paper. 2. Wire coated with double-weight synthetic resin for greater insulating strength. 3. An *extra* sheet of impregnated paper placed between coils in slot, and a new method for holding and insulating end coils. 4. Entire winding assembly given several baked coats of synthetic resin-base varnish and covered with moisture-resistant synthetic resin and tung-oil sealer. . . . *By actual test we can say that the Uni-Shell Motor meets all temperature guarantees—inside and out.*

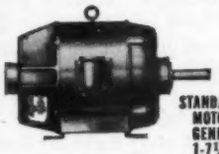


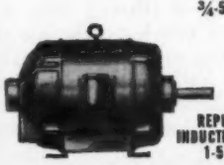
ONLY END HEADS CHANGE

Every dimension, from body to head fit, identical for all motor types.


POLYPHASE INDUCTION MOTOR 1-30 H. P.


CAPACITOR START SINGLE-PHASE INDUCTION MOTOR 1-5 H. P.


STANDARD D. C. MOTOR AND GENERATOR 1-7½ H. P. ¾-5 K. W.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ALL MOTOR TYPES INTERCHANGEABLE

All types in any one frame size in the new Uni-Shell motor line are interchangeable and similar in appearance. Every dimension and detail, from Uni-Shell motor body to head fit, is identical—only the end heads change. And in these cylindrical shells of steel are the finest, longest-lived motors that R & M has built in nearly 50 years of motor specialization. Advances in bearing quality and alignment, precision-balanced rotors, better insulation, cooler interior ventilation and many other features contribute to new high standards of efficiency and performance.

Whether you use motors as a part of your product, or only on the machines in your plant, the advantages of interchangeable motor types, together with the new motor efficiency, are easy to see. Write for your copy of our new 20-page illustrated book on R & M Uni-Shell Motors.

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HOISTS • CRANES • MACHINE DRIVES • FANS • MOYNO PUMPS • FOUNDED 1878

PARTS INVENTORY SLASHED 91% with Increased Output!

With

LAMSON CONVEYORS

In a humming aircraft engine plant, a Lamson engineer set out with company officials to speed production. Lamson Conveyors in the crank case department reduced the distance parts travel from over a mile to 1600 feet. With the efficiency achieved by expert coordination, the parts inventory was cut to 1/12 its former size. The savings on interest alone paid for the entire installation in ONE WEEK!

Incredible? Yes—almost. Yet this is but one of the many such reports of amazing economies in time and money and corresponding increases in production achieved by Lamson . . Lamson Conveyors eliminate the confusion and waste of outmoded materials moving methods and multiply the output of available manpower.

No matter what you make now—or expect to make after the war—it will pay you to have a Lamson materials-handling engineer make a survey of your plant and suggest ways to modernize and streamline production.

Smashing bottle-necks is an old story to Lamson engineers

LAMSON Corporation

Dept. FM SYRACUSE, N. Y.

Makers of CONVEYORS and PNEUMATIC DISPATCH TUBES

ployees find everything new to them and are apt to follow instructions to the letter, whereas a man who has worked in the metal department for years, and has previously used a similar chemical compound to the one in question, may not read the printed directions carefully. He may decide on his own accord—and to the definite disadvantage of the job—that the given formula is not the right one, or that he "knows a better way." Yet this compound usually represents months or years of experiment by highly skilled laboratory technicians, and its ultimate success in all likelihood depends upon strict adherence to instructions provided by its manufacturers.

One Company's Experience

One firm used a certain chemical as one ingredient in lacquer thinners and it was found that wherever this chemical was present women employees in the paint rooms complained of illness. When this ingredient was removed, the complaints stopped. Forced to obtain a substitute chemical ingredient, the manufacturers found one that not only was not objectionable to personnel but also improved the action of their thinner.

Because of the large numbers of women employees, all reliable chemical manufacturers today eliminate noxious and toxic components from their products wherever possible. Women with their more sensitive constitutions were first to complain about objectionable odors and caustic solutions. Because they complained, the products have been improved and whole industries have benefited in higher morale and efficiency. We at Turco Products go farther than 100 percent in elimination of noxious or toxic ingredients. We have even found it desirable to add a bit of perfume to most of our solvents, which makes them much more pleasant to use.

Women Demand Cleanliness

One thing the women employee does demand is clean housekeeping in the factories. Discarded metal chips, excess oil, and grease overflow on floors are objectionable to women employees and hazardous to all. Because women insist on cleanliness, and since many of the maintenance employees themselves are women, we have devised a specially speedy cleaner and bleach for cement areas which is exceptionally easy to apply. Another product particularly helpful to women is a floor-masking compound used in aircraft dope rooms which protects floors from spillage of dangerous "doping" products, as well as providing better lighting for work.

At the great army flight academies where the cleaning of training ships is a major maintenance problems, the use of a portable spraying unit and a quickly soluble compound has lightened and speeded the work of maintenance crews, more than 75 percent of which now are women. We have devised a production line cleaning method for training ships whereby a clean plane leaves the field every fifteen minutes, giving the flying cadets more hours in the air. Once again, women have scored. Making an operation simpler for the women employees actually has speeded a vital part of the war effort.

What "Certified" Means to You

IN SMITHway WELDING ELECTRODES

☆ Every step in the manufacture of SMITHway Certified Welding Electrodes, from raw materials to concentricity and brushing, is subject to rigid shop and laboratory control, unparalleled in the electrode manufacturing business. Our reasons for going to this extra expense are twofold.

First, we have *proved* in our own welding shops that the *time* and *material* costs of welding are governed by the number of *good* welds per hour—*not* by the price per pound of the electrodes.

Second, the number of *good* welds per hour depends, first, last, and always, on the *quality* of the electrodes and how well their *characteristics fit the requirements of the job*. When the electrodes which provide the most desirable characteristics have been found, it is very important that these characteristics be duplicated in subsequent orders.

The serial number on each box of SMITHway Certified Welding Electrodes is the A. O. Smith Corporation's guarantee that the electrodes in that box are *identical* in quality, and in characteristics to previous shipments of that type of electrode. Smith certification, therefore, is your assurance that the price you pay for SMITHway Certified Welding Electrodes buys considerably *lower* welding costs—and considerably *better welding results*.

Mild Steel . . . High Tensile . . . and Stainless Steel WELDING ELECTRODES

Made by welders . . . for welders

SMITHway Welding Monitor: *cuts training time 33⅓%.* ***SMITHway AC Welding Machine:*** *more good welds per man-hour.*

A. O. SMITH *Corporation*

MILWAUKEE • WISCONSIN ★ HOUSTON • TEXAS

CAN MUSIC MULTIPLY MANPOWER?

LOWER ABSENTEEISM?

REDUCE REJECTS?

SENSATIONAL NEW BOOK GIVES YOU THE ANSWER!

Ever thought about MUSIC as a means of easing your *manpower* problem? Want to read about the remarkable results of music in other war plants?

Just off the press, this down-to-earth study contains graphic case-history *proof!* Tells how music, scientifically selected for fatigue relief, lessens absenteeism and accidents—reduces "rejects" and spoilage—helps speed vital war supplies faster to the men at the fighting fronts!

SEND FOR FREE COPY TODAY!

Let the book speak for itself! You'll get authentic *facts*, not fanciful *theory!* You'll get the complete picture of music in industry. Every war production executive should have this exhaustive study for analysis. Send coupon for *your* copy today!

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BOOKS

REWINDING DATA FOR DIRECT CURRENT ARMATURES

G. A. Van Brunt, associate editor, Factory, and A. C. Roe, design engineer, Westinghouse Electric & Mfg. Co. McGraw-Hill Book Co., 330 W. 42nd St., New York. 277 pages. Photographs, drawings, tables, index. $2.50

Second edition of book first published in 1932. Brings reader fully up to date on new techniques in winding direct-current armatures. Changes in practice are largely the result of three developments: (1) Commercial production of woven glass fiber insulation; (2) application of infra-red heating to drying and baking operations; (3) introduction of synthetic, non-oxidizing insulating varnishes. Book is aimed to provide maintenance men and students with the latest information on materials and methods. Seven chapters have been rewritten, seven new ones added.

THE INDUSTRIAL CAFETERIA AND RESTAURANT WORKERS' MANUAL

Milton A. Rosenfeld, restaurant consultant. National Foremen's Institute, Inc., Deep River, Conn. 107 pages. $1.25.

Simple but comprehensive directions on how the workers' restaurant or cafeteria should be run. Emphasizes cleanliness of equipment and personnel, explains how to store, cook, and serve food. Appendixes show (a) food chart, (b) how to make coffee, (c) how to make tea, (d) bibliography, (e) standard sizes in canned food, and (f) storage temperatures and humidities.

COMPANY MUSEUMS

Laurence Vail Coleman, director, American Association of Museums. The American Association of Museums, Washington, D. C. 173 pages. Photographs, index. $2.50.

Designed to show business men the nature and usefulness of company museums and as a guide for people who have museums to manage. Museums are used for business reference and public relations, and are devoted to the history, past and current, of their companies and to technical matters in their lines of business. Appendix describes eighty company museums in the United States and three in Canada.

ESSENTIALS OF INDUSTRIAL HEALTH

C. O. Sappington, M.D., consulting industrial hygienist, president, Central States Society of Industrial Medicine and Surgery. J. B. Lippincott Co., E. Washington Square, Philadelphia. 626 pages. Photographs, tables, charts, index. $6.50.

Attempts to show that industrial health goes beyond the ordinary practice of curative medicine and surgery in industry to the development of industrial health specialities—hygiene and toxicology, sanitation, illumination and ventilation, nutrition, housing, and so on. In two parts—Industrial Health Administration and Industrial Medicine and Traumatic Surgery.

ELECTRONIC CONTROL OF RESISTANCE WELDING

George M. Chute, application engineer, General Electric Co., Detroit. McGraw-Hill

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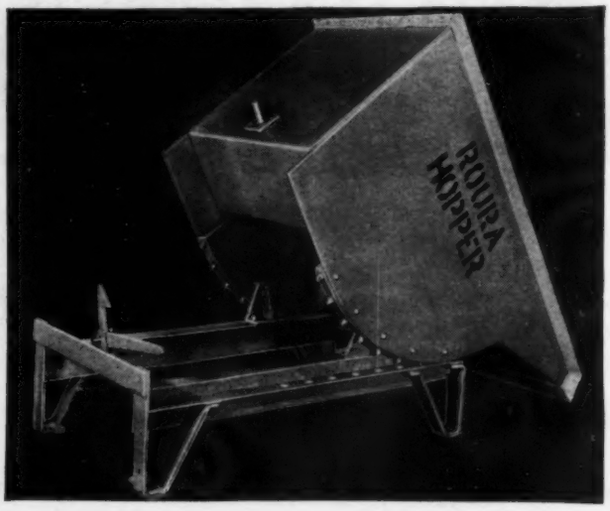

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ROURA IRON WORKS, 1405 Woodland, Detroit, Mich.

Book Co., 330 W. 42nd St., New York. 389 pages. Photographs, diagrams, index. $4.

Practical manual that explains the tubes and circuits used to control resistance welders in industrial plants. Describes electron tubes and their circuits, giving simple electrical background with detailed explanation and diagrams of most tube circuits, including synchronous timers and stored energy controls. In three parts—Ignition Contactor Tubes, and Weld Timers; Synchronous Control of A.C. Welding; and Energy-Storage Welding.

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BOOKLETS

MINERAL WOOL—Loose, Granulated, or Felted Form, in Low-Temperature Installations. Commercial Standard CS105-43. A recorded voluntary standard of the trade. National Bureau of Standards, U. S. Department of Commerce, Washington, D. C. 21 pages. Drawings. 5 cents.

MANPOWER PSYCHOLOGY—An annotated bibliography. Lee J. Cronbach, assistant professor of psychology, State College of Washington, Pullman, Wash. 20 cents per single copy, 10 cents each for ten or more.

GENERAL STORAGE SPECIFICATIONS—for critical and strategic materials. War Production Board, Washington, D. C.

THE NEW PHILOSOPHY OF PUBLIC DEBT—Harold G. Moulton. The Brookings Institute, Washington, D. C. 93 pages.

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ON THE CALENDAR

JULY

14–15, Industrial Recreation Association, Third Annual Meeting, Hotel Pennsylvania, New York. Raymon Millard, Secretary, Purdue University, West Lafayette, Ind.

28–31, Silver Bay Conference on Industrial Relations, 26th Annual Conference, Silver Bay-on-Lake George, N. Y. Earl M. Dinger, Secretary, 347 Madison Ave., New York.

SEPTEMBER

2–4, American Institute of Electrical Engineers, National Technical Meeting, Salt Lake City. H. H. Henline, Secretary, 33 West 39th St., New York.

6–10, American Chemical Society, Semiannual Meeting, Minneapolis. Alden H. Emery, Assistant Manager, 155 Sixteenth St., N. W. Washington, D. C.

23, Association of Consulting Management Engineers, Inc., Meeting, New York. Nathaniel W. Barnes, Executive Secretary, 347 Madison Ave., New York.

28–30, Association of Iron & Steel Engineers, Annual Convention, Hotel William Penn, Pittsburgh. Brent Wiley, Managing Director, Empire Building, Pittsburgh.